A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION

Retirees Bulletin

SUMMER 2001

Inside:

THE NORTH AMERICAN AVIATION B-25H PROJECT NA-98X

EXCERPTS FROM THE SPEECH **"THE ACORN DAYS"**

THE HUN ALSO RISES

THE VALKYRIE AIMS HIGH



THE B-25H #43-4406 RETROFITTED WITH THE R-2800-51 ENGINES AND A-26 COWLINGS IN SUPPORT OF PROJECT NA-98X

Bald Eagles Inc.

North American Aviation Retirees

Bulletin

RETIREES

FALL 2000

Inside:

Bulletin Exclusive Report on Joe Cobb, one of "Our Gang Kids", — by Ken Fowler



Photo Courtesy of Ken Fowler

The Boeing Retiree Office
Gate 510, 2600 Westminster Blvd.

Two doors past the Security Office (arrow) is the entrance to the Boeing Employee Fitness Office and the Retiree Office. Building 81 is in the background, Building 80 can be seen on the far left. Visitor's parking is on the left

North American Aviation Retirees

Bulletin

NAAR is an affiliate of the **Bald Eagles, Inc.** and is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAAR office is located at Boeing, Seal Beach facility. Send mail to:
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Val Yarbrough

MISCELLANEOUS INFORMATION

The Retirement Benefits page will no longer appear, unless readers demands it. Retirees usually receive all the necessary information, benefits and medical plans, at the time of retirement from the Company.
There was some controversies regarding the Retirement Administration. Some retired employees from the Rockwell Corporate Offices receive their pension from Rockwell and could not use the Boeing Benefits Center for inquiries on retirement issues; they must address their questions to Rockwell. .

Services Available to Retirees

Only the Boeing California Employee Fitness, Inc. location at Seal Beach is available to Retirees. To access the facility, retirees must exchange their Retiree Card for a temporary badge at Gate 510 on Westminster Blvd.

Discount tickets to recreation parks are no longer available at the Fitness Center. However, there are a couple sources still available.
Employee Services discount tickets:
1.) www.Boeing.esvp.com/, if you have internet: call 1-877-641-7283
2.) Through employee EASI discount ticket program: call 1-888-608-2911
Disneyland and other parks accept AAA and AARP memberships for discounts.

Retirees on tours wishing to rent a car can benefit from the Boeing Corporate Discount.. The company negotiated contract agreements are:
No. 5555501 for National and No. 147616 for Alamo.
Refer to the pertinent number when negotiating a rate for car rental at National or Alamo. Have your retiree ID card with you all the time

A minor change in the office address

The Retiree Office has now its own Mail Code, SJ 51, in lieu of SJ 90.
We were temporarily sharing the code with the Boeing Employee Fitness, Inc., which is the office adjacent to ours. No disruption of mail has occurred in the change.

WELCOME ED RUSINEK

Ed Rusinek, a retired engineer from Space Division, is the newest member to join our staff of volunteers and went to work like an eager beaver. He attended the grand opening of the Air Force Flight Center Museum at Edward and submitted a detail report for publication in the Bulletin. In addition he provided a story on Gene Salvay from a recent issue of an aviation magazine.
Ed did shop around for a Printing Business that would satisfy our needs and negotiate for the lowest rates. He, also, prepared the application forms for bulk-rate permit and assisted Maxine Haun in the Bulletin distribution. Ed worked in Reliability and Safety at S & ID in Downey for 49 years before retiring; he will be a valuable asset to our operation and we are thankful to have him.

NEW OFF THE PRESS

MUSTANG DESIGNER EDGAR SCHMUED AND THE P-51
BY RAY WAGNER
A well written Chronicle of the design of this legendary airplane
SMITHSONIAN INSTITUTION PRESS, 240 PP, PAPERBACK, $ 19.95

U.S. SPACE GEAR .OUTFITTING THE ASTRONAUT
BY LILLIAN D. KOZLOSKI
Traces development of suits from high altitude flights to modern garb.
SMITHSONIAN INSTITUTION PRESS, 238 PP, 1994, RERELEASED 2000, PAPERBACK, $19.95

FAILURE IS NOT AN OPTION
BY GENE KRANZ
Memoirs of F-86 Pilot to Mission Control for all Mercury, Gemini and Apollo Missions.
SIMON AND SHUSTER, 415 PP, $26.00

MUSTANGS OVER KOREA: THE NORTH AMERICAN F-51 AT WAR, 1950—1953.
BY DAVID MCLAREN
Written reports about the F-51 and the courage and sacrifice of the men that flew it.
SCHIFFER, ATGLEN, 1999, $45.00

BOEING & NORTH AMERICAN RETIREE CLUBS OF SOUTHERN CALIFORNIA CHAPTER

The Old Downey /LAD Retiree Group meets at 10:00 am every 1st and 3rd Thursday of each month at the UAW Union Hall, 1410 Garfield Avenue, Downey. Bill Kelly is the president.

TheAntelope Valley Retiree Group meets at 10:00 am every 2nd and 4th Monday of the month at the Palmdale Fitness Center. All North American retirees are welcome. For more information call (805) 265-3488.

The Boeing Valley Retiree's Club meets on the 3rd Thursday of each month at the Canoga Park Rec. Center. 8500 Fallbrook Ave. Canoga Park, CA. President: Jennie Muncaster (818) 341-8919

The Anaheim Club meets at 10:30 am on the 2nd Tuesday of each month at the Rockwell Aid & Fitness Center, 3450 Miraloma Ave. Anaheim. All NAA retirees are welcome. For more info. call (714) 762-4527.

OTHER RETIREE CLUBS

Autonetics Retirees meets for lunch at 11:45 am. on the 2nd Wednesday of each month at Rembrandt's Restaurant, 909 E. Yorba Linda Blvd., Placentia CA. All Autonetics retirees, spouses and friends are invited.

"Ye Olde Pharts Breakfast Club" meets for breakfast every 4th Thursday of each month at Coco's in Orange.

A group of NAA Retirees meets for breakfast on the 1st Wednesday of each month at the Knotts Berry Chicken Farm Restaurant at 8:15 am. All are invited.

"Aerodyn. - Thermodyn. - Propulsion - Wind Tunnel Retirees" meets for lunch on the 2nd Wednesday at 11:30 am at the El Segundo's Sizzler's Restaurant, corner of Sepulveda Blvd & Mariposa Ave.

"The Old LAD Stress Group" meets approximately every two months at Mimi's Café in Torrance, CA for breakfast. If you were in the old LAD Stress Group and want to join them, contact Gene Laxton (310) 378-3113 or Ed Rosenthal (310) 375-8933

GPS Breakfast Club meets every Wednesday morning from 6:00 to 8:00 a.m. at Primrose Restaurantat the corner of Seal Beach Blvd and Westminster Blvd. All are invited, retired or not.

The Facilities, Industrial Engineering and Plant Services Retiree Group meets on the second Thursday each month at the Jolly Rogers in the Long Beach Marina at 11:45 a.m. Friends and wives, former and current employees are welcome.

The North American Rockwell Retirees Club of McAlester Oklahoma (a satellite of Tulsa, OK) meets each month on the 3rd Tuesday, 10:30 a. m. at the Down Town Meeting Place. For more Information contact:

J. A. Darden, 343 W. Adams Ave. McAlester, OK 74501 or phone (918) 423-0706.

Tulsa & McAlester Retirees meet for breakfast at 8 a.m. on the second monday of March, June, Setember & December at the Harvest Buffet, 3637 S. Nemovial Drive, Tulsa. Call Harry Phillips for more details (918) 838-3716.

The North American Rockwell Retiree group of Columbus, OH. Engineers and Professionals meets each month on the 3rd Thursday at 11:30 a.m. at the Berwick Park House. For more info. contact Byron C. Solomides (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH, meets on the 1st Monday of each month at noon at the Old Rockwell Park (North Hamilton Rd.) E. Hamilton 740-927-5940.

Autonetics Group that includes Marine Systems, Program Office, Project Office, System Test, Engineers, Designers, etc. meets for lunch on the last Wednesday of each month at the Hometown Buffet in Placetia (Rose Avenue and Alta Vista Drive). For more information call Mike Vohs (714) 762-1925.

A group of NAA Retirees from 101 Tooling meet for breakfast at 10:00 am on the first and third Thursday of each month at the Cimarron Café at 5160, 190th St., Torrance (West of Anza Avemue)

Annual Specials

The "Warbird Round-up", sponsored by the Santa Maria Museum of flight - August, 2001

Bald Eagles Reunion - The 39th Annual Reunion is on April 21, 2001

Grants Pass Picnic - 1st Wednesday after Labor Day, September 6, 2000.

Tri-State NAA / Rockwell Reunion - Usually meet in October at the Elks Lodge, Bullhead City, AZ. Call Diane Millard at (520) 758-1554 or Bill Eng (520) 758-5685 or Roy Elwell (520) 754-3175 for information.

NAA-K B-25 Reunion is held yearly at the Wyandotte County Museum. For more information call Harry J. Desko (913) 287-7223 or write to him at 3024 N. 47th St., Kansas City, KS 66104.

Flying Horsemen For year 2000 ROWDY-O contact Bob Morse's home in Grants Pass. Phone: 541-474-1438, or by mail to PO Box 415, Murphy, OR 97533.

The Hangar Gang - This group or retirees meets approximately every 6 months. For more information about this group or when they meet, call Gene Salvay (818) 788-3974, or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

Annual Flight Test Instrumentation Reunion - This group of retirees meet annually at the Fullerton Elk Club. For Information call Ed Mosbrook (714) 531-8060 or Frank Vigil (562) 691-0236.

The Downey Retiree's Club meets at a new home

The Old Downey Retiree's Club, which for many years held their meeting at the Fitness & Recreation Center on Woodruff Avenue in Downey was asked to vacate the premises at the end of 1999. They held their last meeting with a traditional Christmas luncheon last December. The membership in the Club grew very large following the dissolution of the former LAD Retiree's Club in August 1994.

Joe May reported to us that the Club, now referred to as the Old Downey Retiree's Club, has resumed its activities at the UAW Union Hall at 1410 Garfield Ave. in Downey. Bill Kelly presides at the club.

Questions & Answers

Q- You might increase your membership if you notified those who had been receiving the Retiree News of what you are doing.

A– The idea had occurred to us. However, we had about 8300 recipients when the funds were cut off. A simple postcard costs 20 cents, 8000 of them would cost $1600 and we started with zero fund.

We are now sending postcards to those who are inquiring or complaining that they haven't received their Retiree News.

Q– Is there any possibility the "News" could be put on the Boeing web site for reading by employees and retirees. This would certainly cut down on mailing and printing costs.

A– No, we asked Boeing to allow us to put the paper on their web site. We have been denied the writing access. They gave us a positive "thumbs down". However, we are looking into it. We want to create a website of our own and find a server that will allocate an adequate amount of web space to a user for a minimal fee. Some servers do accommodate non-profit organizations. We need to pick one. Also, we must locate an expert in web design to help us. Any volunteers?

Our thanks to all members who have joined the Bald Eagles' NAA Retirees Bulletin Organization.
Special recognition and thanks to all the folks that helped launch the new Bulletin by sending very generous contributions. We couldn't have done it without your help.

The $10.00 annual fee for membership will lapse after the Spring issue and must be renewed during the month of May.

Retirees that have contributed $100.00 or more and staff members that have worked on the Retiree News and Bulletin since December 1994 have been added to a select group called the "Silver Eagles" and are lifetime members..

The Silver Eagles — Lifetime Members

Howard "Bill" Axtell
John Flavin
Ken Fowler
Maxine Haun
Walt Jones
Michel Juif
John Markel
Jesse Mendez
Rex Tabor
Andy Tindley
Stephen Carlson
Robert Nease
Ralph Ruud
Tod Snelgrove
Melvin Wilson

Send us mail for the Mail Bag—Andy Tindley is waiting for your letters. Also don't forget that you can put ads in the Mail Bag if you have something that you want to sell or that you want to buy (No charge for this service, OK!).

NAAR Membership Application

Yes I am a retiree of NAA and would like to be a member and receive the Bald Eagles' NAA Retirees Bulletin. I understand that I must remit annual dues for the continuation of my membership and that I will receive the retiree "Bulletin" four times a year.

First Name Middle Init. Last

_____ ____ _____

Address:_____

City_____ State _____ Zip _____

I worked at: _____ _____ _____
Division (s) years Retired

I am enclosing a check in the amount of $10.00 dues for one year of membership. Donations above the prescribed dues are always welcome. Please do not send cash.

Make check payable to: Bald Eagles, Inc.
And mail: C/o Val Yarbrough, Chairperson
520 Del Oro Drive
Ojai, CA 93023

Look at back cover before peeking at text below.

WWII aircraft on the Back Cover: clock wise, 1 - P-39 Airacobra (Bell); 2 - SB2C Helldiver (Curtiss); 3 - P-47 Thunderbolt (Republic); 4 - JU 87 Stuka (Junkers). How many did you identify correctly?

GRAND OPENING OF THE AIR FORCE FLIGHT TEST CENTER MUSEUM AT EDWARDS.

By Ed Rusinek, RB staff

After eighteen years of sweat and struggle, the Air Force Flight Test Center Museum at Edwards Air Force Base finally held a grand opening on Friday, July 21, 2000. Although it was predicted to be a scorching day on the desert, a slight breeze and a 9:30 AM start for the dedication ceremony made the occasion very tolerable. Several hundred guests gathered in front of the building and speeches were held to minimal remarks before the ribbon cutting ceremony was performed judiciously before the guests were allowed to enter the museum.

The speakers included the base commander, Major General Dick Reynolds; the fastest man in the world and X- 15 test pilot, State Senator William "Pete" Knight; X- 15 test pilot and astronaut, Major General Joe Engle; and the legendary Brigadier General Chuck Yeager. Although not a speaker, the renowned pilot Fitzhugh Fulton was among the honored guests. He flew and tested over 240 different types of aircraft in his fantastic career including the XB-70 and the SR-7 1. Also present was Major General Bob Cardenas, the pilot that flew the B-29 taking Yeager up in the X- 1 to the edge of Space.

The museum is managed and operated by the Flight Test Historical Foundation with Doug Nelson, a retired Air Force Chief Master Sergeant, serving as museum director. A modern 12,000 square foot facility, it is located six miles east of the main gate at the intersection of Rosamond and Lancaster Boulevards. Alongside the museum is the Jimmy Doolittle Air Park with several of the many aircraft Doug has available on display. NAA aircraft currently on display include the X- 15 and a Sabreliner.

Inside the museum, consisting of a main floor with a still unfinished mezzanine, are various mockups, assorted photographs and aviation artifacts, a forty-seat theater and a research library as well as a full-scale replica of Chuck Yeager's Bell X-1 hanging from the ceiling. One wall contains a rather unique timeline display of the aircraft tested at Edwards during the past 50 years. A model of each of the airplanes is mounted on a short post and attached in the appropriate space on the timeline. The NAVAHO X-10, F-86, F-100, XF-107, XB-70 and the B-1 represented NAA.

A new mural, reflecting the "Golden Age of Flight Test" painted by artist Mike Machat, perhaps, best defines the purpose of the museum; the 24-ft. long mural depicts all of the significant planes that were tested at Edwards. The NAA aircraft includes the NAVAHO X -10, XB-70, X -15, Shuttle "Enterprise" and the F-86 and F-100 chase planes.

To cap the ceremonies at the museum, the Air Force provided air-conditioned bus tours of the flight line all morning. Of interest to the old timers, all activities associated with the bomber vehicles have been moved across the field and Marine units previously stationed at El Toro now occupy the two original hangars.

Although it was implied that the honored guests would not sign autographs, they appeared pleased to pose for pictures and to sign photos, covers and other memorabilia. Thus, I was able to get pictures with most of them. Incidentally, the only person to notice and comment favorably on my NAA baseball cap was Senator "Pete" Knight.

If you plan to visit the museum, it is located at 405 S. Rosamond at the intersection of Rosamond and Lancaster Boulevards. It is open Tuesday through Saturday from 9:00 AM to 5:00 PM and admission is free. Since it is on the base six miles inside the main gate, some arrangement may be required to pass the gate. Visitors should call ahead at (661) 227-8050. Membership in the Flight Test Historical Foundation is also available for a minimal fee of $15.00. Requests for membership may be sent to: Flight Test Historical Foundation, P. 0. Box 57, Edwards, CA 93523.

On Saturday, October 21, 2000 the Air Force will hold the annual Air Show at Edwards Air Force Base. The day's activities will include a pass to break the sound barrier by Chuck Yeager and Joe Engle flying in an F-15C.

FIFTY-YEAR CAREER OF GENE SALVAY, NAA AIRPLANE DESIGNER

The August 2000 edition of **WINGS** magazine carried the story of Gene Salvay, a man who spent almost fifty years building or modifying North American Aviation aircraft. The article contains a wealth of information about the golden years of NAA and the multitude of aircraft that were designed and built during that period.

After completing two years of education at the Curtiss-Wright Institute of Technology located at the Grand Central Terminal in Glendale, California, Gene Salvay went to Kansas City where he was hired to do aircraft conversion for Rearwin. He then received a call from North American Aviation and at the age of 22 became head of the B-25 Kansas City Modification Shop Engineering Department

A visit from General Jimmy Doolittle resulted in a redesign of the B-25 bomb bay to carry 6000 lbs. of bombs instead of 2000 lbs., installation of two .50 caliber waist guns, paired-up side guns for the forward fuselage, and replacement of the prone tail gunner position with a gunner in a seated position. As the war went on, other B-25 modifications followed.

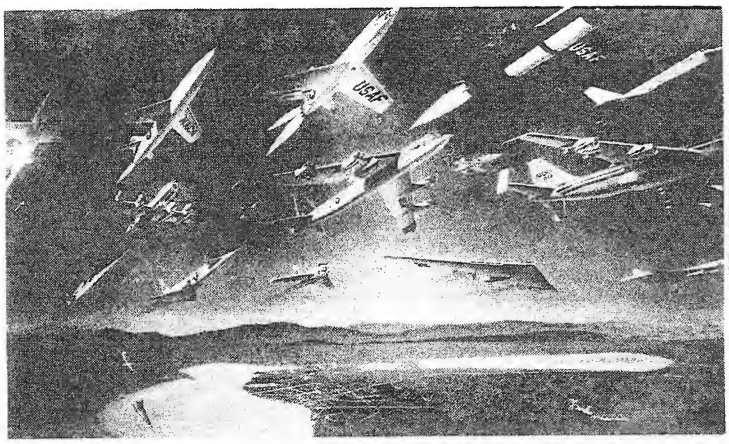
Late in 1944, Gene Salvay was transferred to the NAA facility in Texas where NAA was to build Fairchild C-82's. However, the war ended and the license production by NAA was cancelled before the actual work could begin.

Gene began his post-war career at the NAA main plant in Inglewood, California where he was assigned to finish the structural design of the rear fuselage and tail section for the B-45. This was followed by the design of the fuselages for the P-82 Twin Mustang.

As the years passed other NAA projects arose and Gene was involved in most of them including the AJ Savage, the F-86 Sabre, the F-100 Super Sabre, the Sabreliner, and the B-1. As the aircraft work diminished at NAA and NAA-Rockwell, Gene went to other companies and other countries to assist them in their aircraft design.

In 1986, he decided to close the book on his career. Today, Gene Salvay is retired and lives in Encino, California.

Excerpt from **WINGS** magazine by **Ed Rusinek**

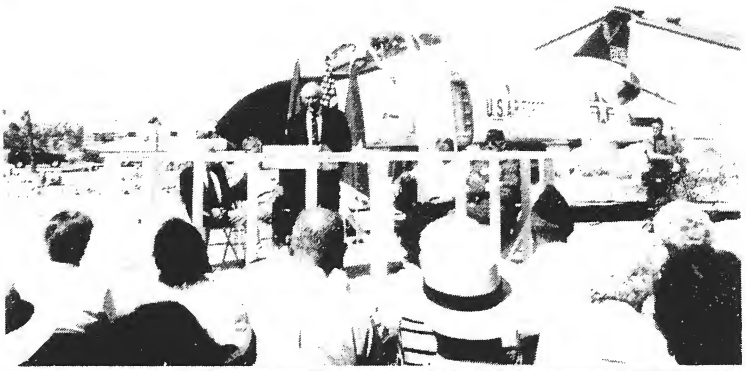




Above Left:
The Mural depicting the "Golden Age of Flight" by artist Mike Machat

Above Right:
A Mockup of the NAA X-15 outside of the Museum and Ed Rusinek

At Right:
General Chuck Yeager addressing guests before the Museur opening

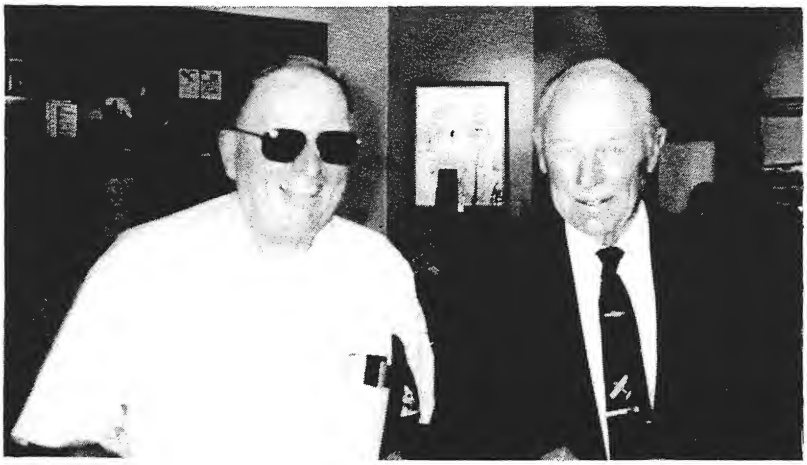




Above: Ed Rusinek with X-15 test Pilot and State Senator "Pete" Knight



With X-15 Test pilot and Astronaut Major General Joe Engle. The "Golden Age of Flight Test", in background



With General Chuck Yeager, graciously signing an X-1 Cover

"Our Gang Kids", Joe Cobb located

Report and photos provided by Ken Fowler

In this old newspaper clipping some of the kids from "Our Gang" can be identified.

To the right of Joe is "Farina" (Allan Clay Hoskin)

Second from Joe, unidentified boy, perhaps Johnny Down? who joined the series in 1924

Next is Pretty Girl played by Mary Korman

Then Baby Doreen, who always had a droopy diaper, played by Doreen Dare

At far right Patsy May, the youngest member of the Gang (she was 15 when she started)

And the dog with one circled eye. Does anyone remember the name of the Dog?



"Our Gang" veteran Joe Cobb is on the far left

In a past issue of the, now extinct, North American Retiree News, we asked if anyone knew the whereabouts of (as our late John Price put it) "That little guy who used to work for North American and was also one of the boy stars in "Our Gang" movie comedy who played the role of Fat Boy". Someone remembered and knew it was Joe Cobb, that John was talking about. Ken Fowler became intrigued by John Price's inquiry and began to do some research on his own. Ken had acquired a lot of friends during his career at North American and some of them remembered Joe Cobb. The search began and bits of information began to arrive and Ken used them to locate Joe Cobb. His perseverance paid off, he did locate Joe Cobb, met him and eventually had breakfast with him on Friday July 28, 2000 in Santa Ana. Had John Price lived he would been so proud of Ken at this moment.

Ken wrote a report for the Retiree Bulletin and in his own words, this is what he said:
"Joe was the original Fat Boy in the "Our Gang" movie comedies. This series ran from 1922 to 1944; a total of 221 were made—more than any other series ever produced. Joe appeared in those from 1923 to 1929. Another boy, 'Spanky' McFarland, eventually replaced him.
Joe will be 84 years old this next November. He still lives in Southern California, as does one of his two sisters; all three were born in Oklahoma. Joe stated that he and his dad were vacationing in Los Angeles and decided to make the rounds of the Movie Studios. His good fortune happened when they came to the Hal Roach studios. The studio was looking for kids like him for the film Hal Roach had in mind of producing. They had lunch with the casting personnel, wardrobe followed and Joe started to work immediately.
Joe hired in North American Aviation in 1942 and stayed with the company for 30 years. He started with the wing group of the B-25 bomber and worked in various departments until his retirement in 1972.
Joe never did grow much taller, but he still has that warm smile and happy disposition. He has some health problems but insist that he's doing fine.

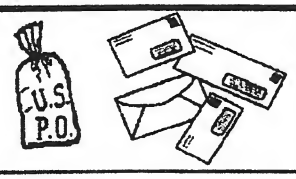


Joe Cobb, today, at the age of 84.



Joe with our staff member, Ken Fowler

THE MAIL BAG



By Andy Tindley (310) 325-6770

E-Mail: AndyOber@Juno.com

It's so good to be back in business. Our thanks to all those who worked so hard to merge with the Bald Eagles and obtain an office space at Boeing, Seal Beach (Michel Juif & Walt Jones). We now have a telephone answering machine and phone number. We also got great response from our "Retirees" whom signed up and paid the fees that allowed us to continue publishing.

Texan Move Notice

Hi Andy

Your message came through loud and clear, Andy

I'm still in Texas but have moved from my old address to: 12337 Montego Plaza Dallas, Texas 75230.

Please let me hear from you.

Don Schnaufer

PS my phone number is 972 9329668

Retired Retiree News:

Dear Andy,

I heard some rumors that if retirees really wanted to contribute some financial support we might be able to save our news letter. I for one would like to save it. I worked with the Columbus Division for 35 years, and always enjoy reading and hearing about all the many people that I was associated with. If you have any up-dates on this possibility, please let me know. The Columbus Division annual picnic is scheduled for September 10, 2000 which I will attend. If you have any up-dates, addresses, or instructions on same let me know. Maybe we could make a short form with instructions, addresses, and recommended costs per person, I could make copies and hand out at the picnic. We usually have a very good turnout. Let me know. I think it would be worth a try.

LeRoy Martin
6919 Gray Gables Lane
Columbus, 0H 43235-4242
Leroym@mailhost.col.ameritech.net
1-614-792-8314

Ohio's Pete Kreider Helps Out

Hi Folks,

You may wonder how PAK happens to be sending this info. When the Retiree News suspended publication last Jan., they announced they would seek ways to resume as a totally volunteer organization and would accept contributions. I had been waiting to hear that Retiree News was stirring and where to send a contribution. The months rolled by with no indications. So I recently asked Bob Nease what he knew. He said, coincidentally he had just received the first re-start issue which had the scoop in it and explained how to resume receiving the newsletter. He sent me a copy, and after digesting this 1st issue of the Bulletin and sending my application for membership, I thought many others are also likely not aware of the restart, and might like to subscribe. So, am sending this Email to all retirees for whom I have E-mail addresses. (See the heading above for a list of recipients.)

The important thing now would seem to be to spread the word. To this end, in addition to taking whatever action you choose for yourself regarding NAAR membership and the Bulletin, why not help get the word out as widely and quickly as possible. To this end, I suggest you send this info, on to all your E-mail correspondents who are Rockwell retirees. Further, you might suggest that they do likewise for their E-mail contacts, and, in turn, these next recipients do likewise, and so forth.

This action can have two major benefits:

1) Get the word out by the fastest and cheapest way possible (E-mail), and thereby encourage many early membership applications so the Bulletin mailing list can grow rapidly.

2) Reduce the significant repro. and mailing costs and decrease the effort by the NAAR Bulletin staff in their efforts to send out announcement of the new Bulletin.

Make check payable to: Bald Eagles, Inc. And mail to:

C/o Val Yarbrough
520 Del Oro Drive, Ojai, CA 93023

All for now. Here's to a successful NAAR organization and Bulletin.

Pete Kreider
1031 Oakmont, CT, Napa, CA 94559
1-707- 224-2800 petekreider@ieee.org

Editors Note:

We thank you for your effort getting the word out to all those folks you had e-mail addresses for. That is the kind of effort we at North American/Rockwell have always done and made us such a good team. Thanks again!
The Word Is Getting Out

Center the ball! Center the needle! We're flying again! Thanks to your group and the Bald Eagles the Retiree Bulletin for N.A. A. Retirees will get airborne!

Please add my wife, Delores, to the Mailing list and me. I retired from Downey in 1971 and my wife in 1980. Enclosed find a check for $10 each. I will try to locate some more retirees in Hemet.

William and Delores Connor
2746 Silver Oak Way, Hemet, Ca *92545*
1-909-925-9060

Jerry From Planning

Dear Walt,

Ollie called last evening and said you may be able to print the Retiree News in June. Am enclosing a little something to help, We all miss it and I am so grateful to you and all your volunteers who have made it possible. I think of many of you so often and if I can help in the future let me know.

I am so saddened by my dear friend Chuck Southwick's' illness . He surely was good to me and I have always been so grateful to him for giving me a break. (I'm sure some would not have) So be it!

My thanks and love to you all.

Jerry Reich

Mailbag Continued

E-mail Works

Dear Val:

I received an e-mail from my fellow worker, Gene Logelin, who advised me of your success in continuing the NAA News Bulletin. WELL DONE!!

Please put me on the retirees' list. I sort of got shuffled around due to my retirement from Rockwell's Corporate Headquarters m Pittsburgh, PA. But I hired on at the original El Segundo/ Inglewood plant right after WW II and my interests remain with the original company and its California Divisions. 'Sides, I was a bomber pilot during WW II so I can get along very well with the Bald Eagles.

We wish you well in all of this volunteered endeavor. Fraternally, William J. Smith 79 Mira Adelante, San Clemente, CA 92673

Rowdy-O XVI

(714) 993-3496

shapsplace@aol. corn

The 16th annual reunion of the North American Flying Horsemen will be held October 20, 21 and 22 at Joan and Harold Shapiro's home in Yorba Linda, California. The planned events include Friday evening, October 20, buffet at 6:00 PM at the Shapiro's. Saturday, October 21, breakfast 9:00 AM at Keno's Restaurant banquet room, hosted by the troop. At 10:30 AM, a self guided tour of the Richard Nixon Library & Birth Place, located in Yorba Linda (for those not attending Director's meeting). At 11:00 AM Director's Meeting at the Shapiro's, at 2:00 PM General Board Meeting at the Shapiro's and at 3:00 PM the traditional Shrimp Feed at the Shapiro's. Sunday, October 22, 10:00 AM Breakfast Leftovers at the Shapiro's and at 11:30 AM, a Day at Santa Anita Park Race track in the Club House Luncheon Terrace. It is anticipated that a race will be named in honor of the Flying Horsemen and the troop's executives will present the trophy to the winning horse. Between races, the troop will be invited down to the winner's circle for a group picture.

Sixty-five invitations were sent out to the remaining 124-recorded members. The whereabouts of the remaining 59 members is unknown. We expect a large turnout.

Those from out of town will be bunking at the Best Western Anaheim Hills Motel located at 5710 East La Palma, Anaheim Hills, California which offers a continental breakfast, HBO with one king or two queen size beds. This is the same place the troop stayed at five years ago. The difference is, previously the motel burned down just before the reunion and the motel was being reconstructed with only suite type rooms being available. Now the regular rooms are available and there won't be any construction noise. Keno's Restaurant is next door to the motel. There is space available at Canyon RV Park (Featherly Regional Park) 24001 Santa Ana Canyon Road, Anaheim, CA 92808 (714) 637-0210 at *$26.55* per night, water and electricity included, for seniors, tax included, for those traveling with their RV's.

Anyone requiring additional information may contact the undersigned at the phone number or e-mail address listed above.

Harold Shapiro, Secretary, North American Flying Horsemen

SILENT MAJORITY—Continued from page 10

PFEFFER, JOHN A., 78 — of Laguna Hills, CA died on April 12, 2000 of lung disease and diabetes. He was an electrical engineer at Boeing.

PISCOPO, FRANK — passed away of pancreatic cancer on March 31, 2000. Jay Kancko notified us.

PREWITT, GALE — passed away April 23, 2000 at home in Anaheim, CA. Gale worked at Autonetics, LAD and Rocketdyne. Her daughter-in-law notified us.

SELLECK, HERBERT — passed away May 6, 1999 from colon cancer. He worked in Autonetics Quality Assurance. His family notified us.

SIMPSON, JONES, 78 — passed away August 6, 2000 in Torrance, CA. He worked at North American Rockwell for over 44 years. Information from a Daily Breeze obituary.

SOUTHWICK, CHARLES, (CHUCK) — passed away May 31. 2000. Chuck worked in Manufacturing and Production Planning at LAD. Gerry Risch and Ollie Stroope notified us. No other information was given.

SOUTHWORTH, WILLIAM E. — 75 of Santa Ana, a retired quality engineer for Rockwell International died April 23, 2000 of renal failure. Information from an obituary sent in by Maxine Haun.

SPIRE, RICHARD R., 73 — of Oceanside, CA, formerly of Orange, CA, died on May 20, 2000. He was an electrical engineer at Rockwell International. We received the information from an obituary sent by Maxine Haun.

STEWART, BILLY JOE, 76 — of Yorba Linda, CA, died May 4, 2000 of cancer. He was a project engineer for Rockwell. Information from an obituary sent in by Maxine Haun.

STRONG, LUCILLE MARY, 72 — died on May 24, 2000 of respiratory distress. She was a retired analyst for Rockwell International. Information from an obituary sent in by Maxine Haun.

VERGILIO, ART, 76 — of Westminster, CA, a retired project manager for Rockwell International, died April 23, 2000 of cancer. Information from an obituary sent in by Maxine Haun.

WEARE, LUTHER S., 84 — died in Palm Desert, CA. He retired from North American Rockwell, beginning anew as editor and publisher of the Idyllwild Town Crier. Patti Hiatt via George Wiley notified us.

WILLIAMS, JACK — passed away February 18, 2000 from pneumonia complications. Jack worked in the Engineering Checking Group and was living in Caldwell, KS at the time of his death. Val Yarbrough notified us.

WILLIAMS, WOODROW COOK, 87 —of Mission Viejo, CA, a retiree engineer for Rockwell International, died May 9, 2000 of a stroke. Information from an obituary sent to us by Maxine Haun.

WOO, KURY, 74 — of Autonetics Flight Control, passed away the week of June 19, 2000 from a sudden stroke. Jay P. Kancko notified us.

YOUNG, JACK, 74 — passed away on June 13, 2000. He worked at NAA Structures Lab, LAD. Jesse Mendez and Mac McGinnis notified us.

SILENT MAJORITY

ASSON, ARTHUR — of Santa Ana, CA, a retired compensation specialist for Autonetics, died July 6, 2000 of natural causes. In formation obtained from an Orange county newspaper's obituary.

BACHMAN, WILLIAM GUSTAVE, JR, 69 — died February 19, 2000 of an apparent heart attack, while on a hike with the Sierra Club in Joshua Tree National Park. He went to work for Rockwell in 1957 where he designed and tested navigational equipment for ships and nuclear submarines. He retired from the LA division in 1989. Information from an obituary sent in by Maxine Haun.

BAKER, VIVIAN JEAN — passed away August 19, 2000. She was an executive secretary at Autonetics for 20 years. In formation obtained from an obituary sent by Maxine Haun.

BECHDOLT, CARL P., 80 -- passed away May 8, 2000. Carl retired from NAA/Rockwell after 40 years with the company. He was a retired Lt. Colonel in the Army Reserve, a former exalted ruler of the Elks Lodge. Long Beach, and was past president of the Seal Beach Management Club. Gordon Palmer notified us.

CAPPA, JOHN JOSEPH, 76 — died suddenly at his home in Yorba Linda, CA on June 29, 2000. He was a design engineer, working for more than 30 years in the design of missiles guidance systems and other aircraft at Rockwell International. In formation obtained from an Orange county newspaper's obituary.

COLSON, AIDA, 68 — passed away May 2, 2000 on her birthday. Her husband, Bill Colson, notified us

COOPER, JAMES R -- passed away, services were held on September 22, 1999 in Columbus, Ohio. He was the husband of Betty Cooper of Sylmar. CA. Sabreliner Division retiree. James worked in Purchasing at Columbus Division. Betty Cooper notified us.

CUENDET, RUSSELL, 81 -- passed away April 22, 2000 at Feather River Hospital in Paradise, CA. He was an aeronautical engineer for North American Rockwell for 32 years, served in the U.S. Army during WWII and was president of the California Tip Toppers Club in 1948. Russell was an avid bike rider, mountain climber and fisherman. Forry White, Paradise, CA notified us.

DANIELS, JOHN WILLIAM, SR., 79 --He retired from Autonetics, the U. S. Navy and the California State College System. Information from an obituary sent in by Maxine Haun.

DAY, HAL — passed away in early April and was buried April 10, 2000 at March Field National Cemetery with full military honors. Hal was a fighter pilot in WWII and retired from the Air Force Reserve as a Lt. Colonel. He spent considerable time in Japan as an NAA rep and was a B-l Project Engineer when he retired. Hal was married to June Murray, who many of you will remember as secretary to several Engineering managers. Hal and June were faithful attendees at the Bald Eagles and active in the Retiree club. Dave Wisted notified us

DENNIS, IRENE — passed away last year from a heart attack. Rex Tabor and Ollie Stroope notified us.

DOUGLAS, GEORGE — passed away June 6, 1999 in Fayetteville, AK.

ECKERLE, HARRY F. JR., 78 of Tustin, CA, an electrical engineer, died on June 15, 2000 of kidney failure. We were notified by Maxine Haun.

EVANS, ESTHER, 87 — OF Anaheim, CA died on July 12, 2000 of an aneurysm. She was a secretary in Retirement-Labor Relations with Rockwell International at both Downey and Anaheim. Her dear friend, Maxine Haun, notified us.

FLEMING, THOMAS L. — passed away recently. He worked at LAD, where he was hired, and at Long Beach. Mac McGinnis notified us.

FOSTER, CHARLES LEROY, 71 — of Anaheim, CA, Maintenance worker, passed away On May 21, 2000 of heart disease. Information obtained from an obituary sent by Maxine Haun.

GARCIA, ARNOLD, 73 — of Yorba Linda, CA passed away on August 11,2000. He was a Systems analyst for Rockwell International. Information obtained from an obituary sent by Maxine Haun.

GONZALEZ, RICARDO (RICK) — passed away on May 12, 2000, awaiting a liver transplant. Rick worked at LAD and was a member of the Torrance Masonic Lodge.

HANLON, ED -- passed away in May of this year. He was living in Placerville, CA at the time of his death. Ed worked in the Structural Machine Center, Planning, and in Scheduling management at the LA Division. Rod Miller of Medford, OR notified us

HADLEY, JACK, 75 — of Huntington Beach, CA, passed away from a brain tumor. Jack worked in the MPP group. No other information was available.

HILL, JAMES M. — passed away January 23. 2000. from a heart attack. He retired in 1975 from Space Division. No other information was available.

HOLT, LOREN G., 68 — of Huntington Beach, CA, died on April 7, 2000 of lung failure. He was a retired administrative assistant at Rockwell International. Information obtained from an obituary sent by Maxine Haun.

KELLNER, HARRY BURTON, 92 — of Laguna Woods, CA died June 20, 2000 of natural causes. He was a Quality Control Supervisor at Rockwell International. Information obtained from an obituary.

LOPEZ, ROBERT PLACENTIA, 79 — of Anaheim CA died June 21, 2000 of cancer. He was a retired design engineer at Rockwell International. Information obtained from an Orange County newspaper obituary.

MANDARO, FRANK, 80 — of Laguna Hills, CA died June 13, 2000 of kidney failure. Frank spent over 24 years with NAA/ Rockwell, holding various engineering and management positions on various program, including the Apollo Space Program. Information obtained from an obituary sent by Maxine Haun.

MILLER, VICTOR ADDISON — passed away at his home on July 9,2000, under hospice care for colon cancer. He worked for NASA, North American Aviation, Coinco and TRW. Information obtained from an obituary.

ORLANES, JOSE, 80 — died February 16. 2000. Born in the Philippines, he received his engineering degree at UCLA. Over the years he worked for Rockwell and General Dynamics as well as Douglas as a facilities engineer and spent 23 years in the Air Force. Information from a newspaper article sent in by Maxine Haun.

PAONESSA, PHIL — passed away August 14, 2000 of congestive heart failure, he was in his 70's. Phil worked at Autonetics, Contracts, from mid-1961 until his retirement in 1989. Chuck Clark (of Autonetics & Collins) notified Maxine Haun

Silent Majority continued on page 9

BALD EAGLES INC. — BOARD OF DIRECTORS

Val Yarbrough — President &Treasurer	Estelle Albaugh — Committee	Walt Spivack — Committee
Glenn Penner — Past President	John Hollingsworth — Committee	Earl Theaker — Committee
George Wiley — Secretary	Neil Dopheide — Committee	Joe Onesty — Committee
Pat Cunningham — Coordinator	Walt Jones — Committee	Bill Stolz — Committee
Michel Juif — Badges & Bulletin editor	Al Kustra — Committee	Marc Malsby — Committee
Betty Richardson — Hostess	Amby Baccaro — Committee	Maxine Haun — Committee
Lee French — Photographer	Larry Livers — Committee	

BALD EAGLES REUNION—YEAR 2001

The 39th annual Bald Eagles Reunion will be held Saturday, April 21, 2001, at the Proud Bird Restaurant, 11022 Aviation Blvd.

Unlike previous years, announcement for the year 2001 Reunion **will not** be mailed out to Bald Eagles members. The Retirees Bulletin remains the **only** source of communication between the organization and its members.

Reminders and further instructions will appear on the next two issues of the Bulletin,

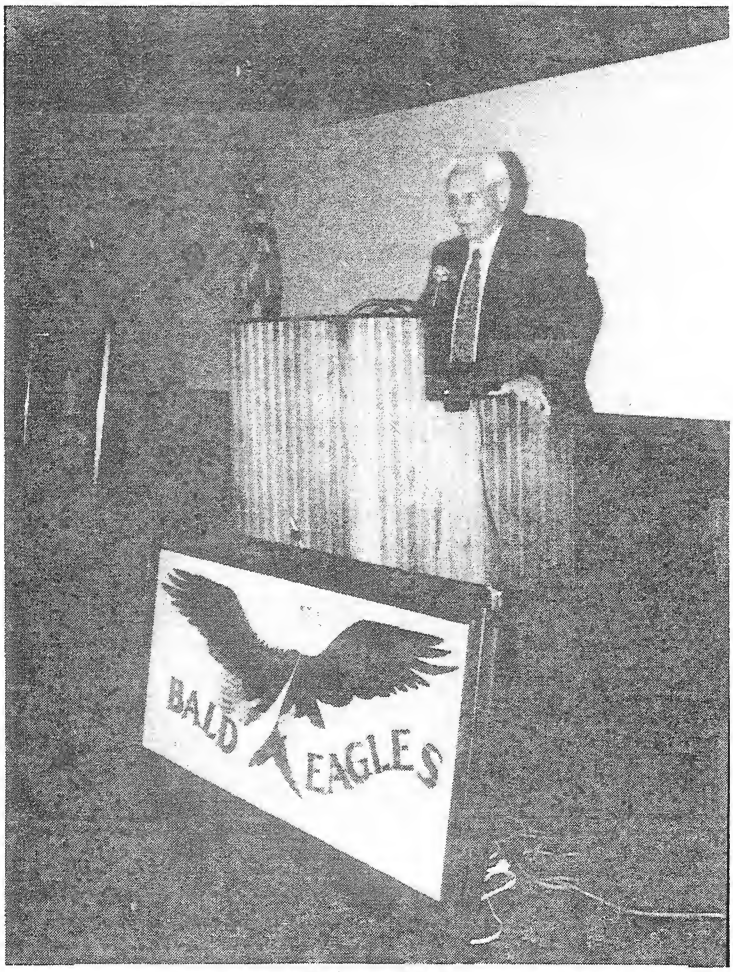
Y2K Keynote Speaker

Ralph Ruud, past president of the Los Angeles NAA Division, was the keynote speaker at the 38th annual Bald Eagles Reunion.

The photo at right should have been on the "First Issue" (Spring / Summer) of the Retiree Bulletin.

Pictures of Mr. Ruud at the podium were not available at the time the Bulletin was sent to the press.

Our apologies for the omission.



Ralph Ruud

Photo courtesy of Larry Livers

New Chairperson

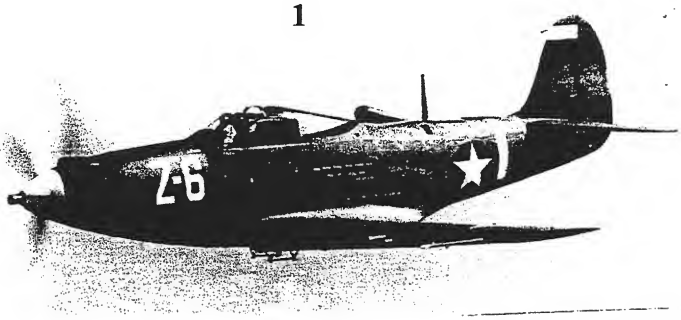
A Board of Directors meeting was held at the Proud Bird following the luncheon of April 15, 2000.

Val Yarbrough was chosen as the new President of the Bald Eagles for the year 2000/2001. She is succeeding Glenn Penner who requested to be replaced as Chairman after the 38th Reunion.

Val will retain her Treasurer status along with the chairmanship position.

Can you identify these WWII aircraft?

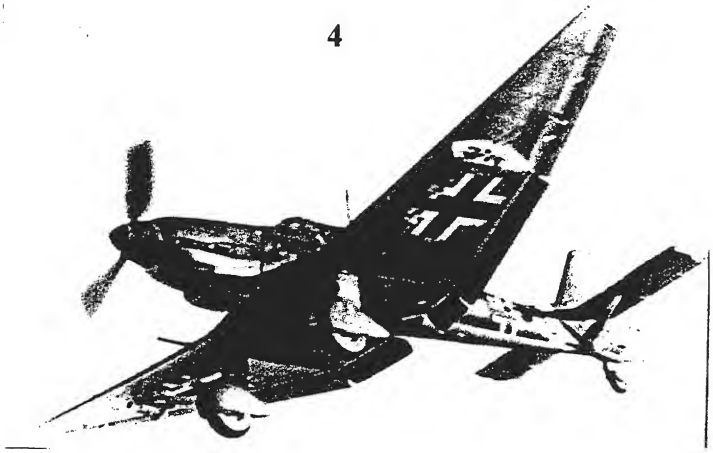
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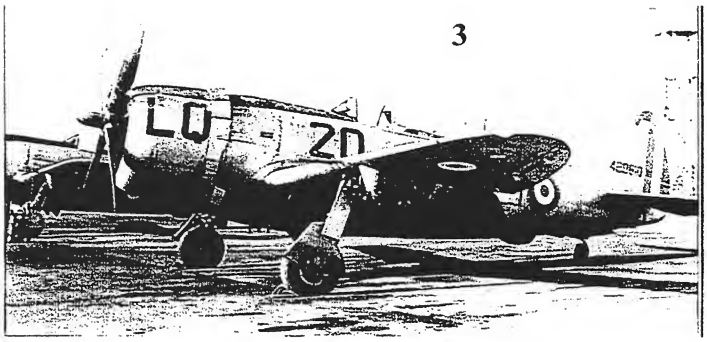
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4



3



Answers can be found, somewhere, inside this issue.

North American Aviation Retirees Bulletin

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North American Aviation Retirees

Bulletin

NAA RETIREES

WINTER 2000

Season's Greetings

Inside:
Viewing a Shuttle Launch (STS-92/Discovery) - By Ed Rusinek
A Son Remembers His Father, Edgar Schmued—By Rolf Schmued



The Space Shuttle (STS-92/Discovery) Crew

From Left to Right

Standing: Astronauts Leroy Chiao, Michael Lopez-Alegria, William McArthur Jr., Jeff Wisoff, and Koichi Wakata

Sitting in Front: Pilot Pamela Melroy and Commander Brian Duffy

North American Aviation Retirees

Bulletin

DEAR NAA RETIREE NEWS READER:

Hooray! Hooray! We are back! Thanks to some generous contributions we have enough "seed money" to start publishing the new NAA RETIREES BULLETIN on a limited scale. As you know, Boeing has withdrawn all financial support, so we have to ask you to subscribe if you wish to receive our publication.

Since most of you are not aware of our return, we are taking a big chance and sending this issue to all our previous 8300 free subscribers with the hope that they will send us the $10.00 fee. The ten bucks will buy you the next four quarterly issues plus a membership in the Bald Eagles, Inc., regardless of the length of employment you had with the company. If we don't hear from you, we will assume that you are not interested and this issue will be our final communication.

Why not take a few minutes and fill out the little membership form on this page and send it along with your check. If you like to be sure someone else should also receives this publication, double the amount of your check. And give us their name and address. We will drop them a post card, telling them of your generosity! Please make all checks payable to Bald Eagles, Inc.

Use of the form below is not mandatory, it is only a convenient way of subscribing. If you want to preserve your issue and not cut out the form, you may just write us a note and give us the same information that are on the form. If you wish, affix one of your return address label in lieu of writing your address by hand

If you have already sent us the $10.00, you are paid up through the four issues for 2001. This will simplify our bookkeeping if everyone comes due at the same time. If you have sent $20.00 you are paid up through 2002. If you sent $100.00, you have bought yourself a lifetime membership! Your name will be added to the Silver Eagles. Whatever you sent, God Bless!

The above information supersedes the statement made in the Editor's Corner (Fall 2000 issue), in reference to the annual fee lapsing after the Spring issue.

Motions were made at the BOD meeting on all above pertinent matters and were approved unanimously, including the elimination of the 25 years requirement for Bald Eagles membership. All Retiree Bulletin readers are also Bald Eagles members.

MEMBERSHIP FORM

RETIREES BULLETIN OFFICE
PO Box 3644, M/C SJ51
Seal Beach, CA 90740-7644

Yes, I am a retiree of NAA/Rockwell and I want to be a member and receive the NAA Retirees Bulletin. I am enclosing a check payable to the Bald Eagles, Inc. for $ _____
For every $10.00 I will receive four issues.

Name _____
Street Address _____
City/State/Zip _____

I retired from_____ Division
After _____ Years of Service

GIFT SUBSCRIPTION

Also, please send a gift subscription to:

Name _____
Street Address _____
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I am enclosing payment and I understand you will be send a gift card to recipient.

The Silver Eagles -Lifetime

Howard "Bill" Axtell
William H. Beckner
Stephen Carlson
Robert W. Dagand
Charles T. Davison
John Flavin
Ken Fowler
Maxine Haun
Walt Jones
Michel Juif
John Markel
Jesse Mendez
Robert Nease
Ralph Ruud
B.J. & Ken Schell
William Schleich
Tod Snelgrove
Rex Tabor
James L. Thresh
Andy Tindley
Stanley White
Melvin Wilson
Lee Wiltsie

NAAR is an affiliate of the **Bald Eagles, Inc.** and is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAAR office is located at Boeing, Seal Beach facility. Send mail to:
Retirees Bulletin Office
2600 Westminster Blvd
PO Box 3644, M/C SJ 51
Seal Beach, CA 90740
Or call: ☎ (562) 797-3836
Or Fax: (562) 797-3848

NAAR Staff
(562) 797-3836

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Co-Editor Walt Jones

Assistants
John Flavin, John Markel, Ken Fowler
Ed Rusinek, Maxine Haun

Computer Inputs (Home PC only)
Andy Tindley : (310) 325-6770 (home) "Mail Bag", Special Features, Graphics, Clubs and Miscellaneous.
Howard "Bill" Axtell & Walt Jones: "Silent Majority"
Ed Rusinek: Reporter, Mail Coordinator
Maxine Haun : Membership Subscriptions
Treasurer
Bald Eagles & Retirees Bulletin
Val Yarbrough

Bald Eagles Board of Directors
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Lee French, Maxine Haun,
John Hollingsworth, Al Kustra
Larry Livers, Marc Malsby,
Joe Onesty, Betty Richardson,
Walt Spivak, Bill Stolz,

"To grumble is Human. Men Grumble because they are served turkey in place of goose, or vice-versa. Grumbling is as necessary to most men as fleas are to dogs. A reasonable amount is good for both of them, as it keeps them interested in life. It is the almost invariable rule that men who grumble mean nothing by it. Too much grumbling, however, will get any man in wrong in time and it is best to limit this art to whatever is necessary for the man's pleasure in life."
U.S. Navy Blue Jackets Manual, 1940 edition

NAA/ ROCKWELL/BOEING RETIREE CLUBS and GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Bill Kelley (714) 637-9374

TheAntelope Valley Retiree Club meets at 10:00 AM every 2nd and 4th Monday of the month at the Palmdale Fitness Center. All North American retirees are welcome. For more information call (805) 265-3488.

The Boeing Valley Retiree's Club meets on the 3rd Thursday of each month at the Canoga Park Rec. Center. 8500 Fallbrook Ave. Canoga Park, CA. President: Jennie Muncaster (818) 341-8919

Autonetics Retirees meets for lunch at 11:45 AM on the 2nd Wednesday of each month at the Rembrandt Restaurant, 909 E. Yorba Linda Blvd., Placentia CA. All Autonetics retirees, spouses and friends are invited.

"Ye Olde Pharts Breakfast Club" meets for breakfast every 4th Thursday of each month at Coco's in Orange.

A group of NAA Retirees meets for breakfast on the 1st Wednesday of each month at the Knott's Berry Chicken Farm Restaurant at 8:15 AM. All are invited.

"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meets for lunch on the 2nd Wednesday at 11:30 AM at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd & Mariposa Ave.

"The Old LAD Stress Group" meets approximately every two months at Mimi's Café in Torrance, CA for breakfast. If you were in the old LAD Stress Group and want to join them, contact Gene Laxton (310) 378-3113 or Ed Rosenthal (310) 375-8933

The Downey Engineering Group of Retirees known as "The Choir Boys" meets every Thursday for lunch at various restaurants from Seal Beach to Downey. Call Al Risi at (714) 892-5725 for meeting location.

GPS Breakfast Club meets every Wednesday morning from 6:00 to 8:00 AM at the Primrose Restaurant at the corner of Seal Beach Blvd and Westminster Blvd. All are invited, retired or not.

The Facilities, Industrial Engineering and Plant Services Retiree Group meets on the second Thursday each month at the Jolly Roger in the Long Beach Marina at 11:45 AM. Friends and wives, former and current employees are welcome.

The North American Rockwell Retirees Club of McAlester Oklahoma (a satellite of Tulsa, OK) meets each month on the 3rd Tuesday, 10:30 AM at the Down Town Meeting Place. For more Information contact:

J. A. Darden, 343 W. Adams Ave. McAlester, OK 74501 or phone (918) 423-0706.

Tulsa & McAlester Retirees meet for breakfast at 8 AM on the second monday of March, June, September & December at the Harvest Buffet, 3637 S. Nemovial Drive, Tulsa. Call Harry Phillips for more detail call (918) 838-3716.

The North American Rockwell Retiree Group of Columbus, OH. Engineers and Professionals meet each month on the 3rd Thursday at 11:30 AM at the Berwick Park House. For more info. contact Byron C. Solomides (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH, meets on the 1st Monday of each month at Noon at the Old Rockwell Park (North Hamilton Rd.) E. Hamilton (740) 927-5940.

Autonetics Group that includes Marine Systems, Program Office, Project Office, System Test, Engineers, Designers, etc. meets for lunch on the last Wednesday of each month at the Hometown Buffet, Rose Avenue and Alta Vista Drive in Placentia. For more information call Mike Vohs (714) 762-1925.

A group of NAA Retirees from 101 Tooling meets for breakfast at 10:00 AM on the first and third Thursday of each month at the Cimarron Café at 5160 190th St., West of Anza Avemue in Torrance.

Annual Specials

The "Warbird Round-Up", sponsored by the Santa Maria Museum of Flight - August, 2001

Bald Eagles Reunion - The 39th Annual Reunion is on April 21, 2001

Grants Pass Picnic - 1st Wednesday after Labor Day, September 5, 2001

Tri-State NAA / Rockwell Reunion - Usually meet in October at the Elks Lodge, Bullhead City, AZ. Call Diane Millard (520) 758-1554, Bill Eng (520) 758-5685 or Roy Elwell (520) 754-3175 for information.

NAA-K B-25 Reunion is held yearly at the Wyandotte County Museum. For more information call Harry J. Desko (913) 287-7223 or write to him at 3024 N. 47th St., Kansas City, KS 66104.

Flying Horsemen For year 2001 ROWDY-O contact Bob Morse's home in Grants Pass. Phone: (541) 474-1438, or by mail to PO Box 415, Murphy, OR 97533.

The Hangar Gang - This group of retirees meets approximately every 6 months. For time and date or additional information call Gene Salvay (818) 788-3974, or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

Annual Flight Test Instrumentation Reunion - This group of retirees meet annually at the Fullerton Elk Club. For Information call Ed Mosbrook (714) 531-8060 or Frank Vigil (562) 691-0236.

If your group of retirees is not included in the CALENDAR OF EVENTS, please notify us either by writing to the Retirees Bulletin Office at our Seal Beach address, or by calling (562) 797-3836. Be sure to give us the name of your group and/or a nickname, if you have one. Use the "Who, What, When, Where" format as in the examples above. A person to contact for information and a telephone number would also be very useful.

Another Recreation and Fitness Facility Bites the Dust.

Boeing's facility (formerly Autonetics) in Anaheim is closed forever .

The center was built by North American Aviation in 1962 and Rockwell International ran it for 30 years.

Not only, was it a great place for employees and retirees to keep in physical shape, but it had many other activities and clubs.

There were company picnics and retirees luncheons. It also hosted the Ceramic Club, the Radio Club, the Photography Club, the Mineral Club and even a Gun Club.

Other groups also held their meeting there, such as the Masonic Aerospace Club and Ham Operators.

Cynthia Kroll, a UC Berkeley economist who has studied the aerospace industry said, "There was a different view of corporate life then. In many ways, the company provided a whole setting for a person's life, not just a paycheck."

Boeing, which took over local operations from Rockwell in 1996 has sold the 20-acre property on Mira Loma Avenue to another undisclosed business.

To date the bulldozers have begun to leave their marks and are in the process of demolishing the buildings and clearing the land. Viewing the site is very depressing and has angered many employees and retirees, some of whom made their feelings known by e-mail missives to higher-ups.

Boeing officials declined to name the buyer or the price, pending escrow, but sources said the buyer is in the surf-wear business.

A similar, but smaller, Fitness Center will open soon in Huntington Beach for Boeing employees

Send us mail for the Mail Bag—Andy Tindley is waiting for your letters. Also don't forget that you can put ads in the Mail Bag if you have something that you want to sell or that you want to buy (No charge for this service, OK!).

MISCELLANEOUS INFORMATION

All NAA / Rockwell / Boeing Retirees that have a need to contact the BNA Benefits Center must have their Personal Identification Number (PIN) available before attempting a call to the Center.

The telephone Number is 1-800-438-3116. The business hours are from 10 AM to 6 PM (EST) M through F.

If you don't have one or forgot your PIN, you must write to the Center:

BNA BENEFITS CENTER
PO Box 24567
Jacksonville, FL 32241-4567.

Services provided by the Center are:

Life events, enrollment or change in medical/dental plans, address changes, plan comparisons of medical benefits, answers to general health/dental/vision and life questions, health care/Life Insurance direct billing procedures and confirmation statements.

The above information does not apply to retirees from the Rockwell Corporate Offices. These former employees remain under the Rockwell Corporation benefits and pension plans

Other Services Available to Retirees

Only the Boeing California Employee Fitness, Inc. location at Seal Beach is available to Retirees. To access the facility, retirees must exchange their Retiree Card for a temporary badge at Gate 510 on Westminster Blvd.

Discount tickets to recreation parks are no longer available at the Fitness Center. However, there are a couple sources still available.

Employee Services discount tickets:

1.) www.Boeing.esvp.com/, if you have internet: call 1-877-641-7283

2.) Through employee EASI discount ticket program: call 1-888-608-2911

Disneyland and other parks accept AAA and AARP memberships for discounts.

Retirees on tours wishing to rent a car can benefit from the Boeing Corporate Discount.. The company negotiated contract agreements are:

No. 5555501 for National and No. 147616 for Alamo.

Refer to the pertinent number when negotiating a rate for car rental at National or Alamo. Have your retiree ID card with you all the time

NEW OFF THE PRESS

THE NORTH AMERICAN P-51 MUSTANG
BY LARRY DAVIS

A photo chronicle. Begins with Mustang production in early 1941 initiated by the British order for 320 aircraft with Mustang 1, RAF s/n AG345 rolling off the assembly line on April 1941. The latest P-51D, considered the ultimate Mustang, the lightweight P-51H and twin Mustang F-82 are also covered.

SCHIFFER PUBLISHING.
112 pp, ISBN: 0-88740-411-1, PAPERBACK, $19.95

Look at back cover before peeking at text below.

WWII aircraft on the Back Cover: 1 - B-17 Flying Fortress (Boeing); 2 - B-26 Marauder (Martin); 3 - B-24 Liberator (Consolidated); 4 - B-32 Dominator (Convair). How many did you identify correctly?

BY ED RUSINEK,
Staff Reporter

VIEW A SHUTTLE LAUNCH (STS-92/DISCOVERY)

Although, it has been twenty years since my last visit to the Kennedy Space Center and over 30 years since I was assigned here as the Reliability Project Engineer for SC009, the first unmanned Apollo, and Apollo 7, the first manned vehicle after the Apollo I fire; this was not a sentimental journey for me into the past. The purpose of my visit was to finally see a Space Shuttle launch!

Arriving at T-2 Days, I drove down the Beeline Expressway from Orlando to Cocoa Beach and was almost swamped by a fast moving squall. The rain persisted and the prognosis for a launch on time was very gloomy. The Cocoa Beach / Cape Canaveral area remains the same as I remember it in many ways yet different in others.

Probably two of the most popular Cocoa Beach restaurants in the old Apollo days, Alma's and Bernard's Surf, are still in business. However, the restaurant on top of the new bank building is long gone and the building itself looks decrepit. The Polaris Motel with its notorious Mouse Trap bar has been demolished and replaced by a huge restaurant. I wonder if they got rid of the hordes of palmetto bugs (cockroaches) at the same time when they tore the buildings down.

Cape Canaveral has also experienced change. Evidently, the once vaunted museum displaying salvaged Spanish gold coins has been opted into a huge sex shop. I did not venture to go inside so I cannot discuss its attributes! The Fat Boy BBQ, so often mentioned by Walter Cronkite during his Apollo launch visits, is still here but of little greasy consequences. Port Canaveral is expanding its facilities to accommodate the lucrative cruise lines but one of the lines has already gone under (only financially!).

As your credentialed member of the Press, I went on a T- 1 Day orientation tour of KSC, which allowed me the opportunity to observe the changes that have been incorporated since I was part of the launch team. First stop was the Vertical Assembly Building (VAR). Although four of the huge bays were used to prepare the complete Saturn/ Apollo vehicles, only two of the bays are now being used to stack the Space Shuttle with a third kept available as a haven in case of a rollback because of hurricane dangers at the pad.

Just northwest of the VAB is the Shuttle Landing Facility with its 15,000 ft long x 300 ft wide runway with 1,000 ft extensions at each end. From there, the orbiter is moved on the towway to the Orbiter Processing Facility (OPF) almost adjacent to the VAB. Entering the OPF, we did a walkaround ATLANTIS that had landed at KSC two weeks earlier and was being prepared for its next mission. The vehicle had been jacked up off its wheels and extensive tile replacement and repair had been completed. Interestingly, the orbiter thermal tiles being used to replace damaged tiles are all being custom made here on location within this small industrial complex.

The three Space Shuttle Main Engines (SSME's) had been removed from ATLANTIS and sent to the SSME OPF next door. We were offered the opportunity to visit that facility and were given a short tour by one of the accommodating technicians. As we were leaving, I asked him his company affiliation. He answered, "Oh! I'm Boeing Rocketdyne. Are you familiar with my company?" I responded, "I knew your company when it was only the Propulsion Group in Downey, California and all the engineers had pieces of German V-2 rockets strewn all over their desks!"

A visit to Launch Pad 39A was somewhat dampened by another short cloudburst, so taking good pictures of the Space Shuttle on the pad was somewhat dubious. Some of the Press had cameras worth tens of thousands of dollars and they toweled them down with growing anxiety. I had no such problems with my $ 69.00 Nikon!

As our tour bus drove around the launch pad, I noticed a group of people setting up what looked like rural mailboxes or small dog houses on top of posts on any slight rises next to the road, all pointed at the stack. I asked one of the media people what they were doing and he informed me that they were commercial photographers setting up their cameras in these little shelters from the rain. Since we were so close to the pad it was obvious that the people could not be present at time of lift-off. The cameras are triggered to shoot by acoustic devices, which initiate the action when the SRBs ignite with a roar. The cameras track the vehicle for only a few seconds after it leaves the pad. Incidentally, if this method results in one or two excellent still shots, the photographer is very happy with the results.

The next stop on the tour was at a relatively new building (located just east of the Operations and Checkout Building), called Space Station Processing Facility. In this building, modules destined for the International Space Station are brought in for a final checkout before loading into the delivery Shuttle. I noticed that the Canadian arm designed for use on the ISS is a telescoping design, compact and much shorter than the Shuttle arm when stored. Some of the ISS trusses are too large for this facility and are housed in the 0 & C Building.

Launch Day started with a bright cloudless morning. It looked like a great day for a launch! About 1:00 PM in the afternoon, the Press Site received the disheartening announcement. Examination of photo evidence from the previous mission indicated that the Aft Right Attach Bolt between the ET and Orbiter did not retract properly and "almost 3 in. remained protruding". The mission was scrubbed until the following night. The next morning it was announced that the Pogo Accumulator Recirculation Valve, which must open at T-12 Seconds, did not cycle properly and would have to be replaced. This would take an additional three days. In this timeframe another hardware issue was found and cleared but then the weather closed in and caused another one-day slip. Finally, six days after the original scheduled date, DISCOVERY appeared ready to go.

It was a perfect liftoff as DISCOVERY began its eleven-day journey to rendezvous and dock with the ISS. DISCOVERY will deliver two major segments of the ISS, an exterior framework called the Zenith (Z-l) truss and a third mating adapter. These units will be attached to the ISS using the Shuttle robotic arm

Coming here was a sentimental journey after all.

About the Shuttle

The 28th flight of the Space Shuttle DISCOVERY, that occurred on October 12th, 2000, marks the 100th mission launched from Kennedy Space Center. STS-92 (also designated as International Space Station Flight 3A) will continue the preparation of the ISS for its resident crew. Out of 100th flights designed for each orbiter, DISCOVERY will be the most-flown Shuttle after completion of the STS-92 mission. DISCOVERY'S primary payload, the Zenith (Z-1) Truss, is the cornerstone truss for the ISS. This component carries many critical items for the Station's attitude, communicators, thermal, and power control systems.

BY ROLF SCHMUED

A SON REMEMBERS HIS FATHER, EDGAR SCHMUED

My father's story is the fulfillment of the American Dream where a young immigrant with ambition and perseverance rises to the top of his profession.

Edgar Schmued was born on December 30, 1899 in Hornbach, Germany of Austrian parents. His father was a dentist. Edgar, the eldest, had two brothers and three sisters. He was not a distinguished scholar but he was fascinated by the technology of the day, which involved aeronautics. He read and studied anything he could find pertinent to aviation.

Toward the end of World War I, he was old enough to enter the Austrian military service and fortunate enough to be assigned to a ground support unit within the air service. The war soon ended but the interest in aviation remained. He found work in a machine shop, which gave him some practical experience. He designed a small sports plane but it led to a dead end because Germany was not allowed to build aircraft.

Edgar met and married Luise Heyne and in 1921 had a son, Rolf. With these added responsibilities, he sought to come to America. However, the immigration quotas made it very difficult to enter the United States. Therefore, in 1924, Edgar decided to immigrate to Brazil where entry was much easier. Luise and Rolf would follow when he became established in Brazil.

He was hired by General Motors of Brazil as a supervisor of dealer service facilities, which involved extensive travel throughout Brazil. This gave him greater knowledge of mechanical systems and how to work with people. But it was only a step in his wish to come to America and become an aircraft designer.

In 1930, Edgar received his visa to come to the United States. He found work at Fokker Aircraft in Hasbrouk Heights, New Jersey. His first assignment was to design a hinge. Other assignments and responsibilities followed.

However, what happened next was totally unexpected. Through a series of mergers and acquisitions, Fokker became Berliner-Joyce, than General Aviation and, finally, North American Aviation, Inc. By this time, Edgar had advanced to the position of project engineer for the YO-47, a three-man observation plane for the U. S. Army Air Corps.

In 1933 he felt secure enough to send for Luise and Rolf. This was the first time the family was together since he left Germany except for a one-year



Luise and Ed with their son, Rolf, on the left

stay in Brazil. There the family was torn apart when an adjacent building collapsed and Luise sustained major injuries. She and Rolf returned to Germany for extensive medical treatment.

Dutch Kindelberger became president of NAA and in 1935 decided to move the company to California. Luise, yearning for some sort of stability in her family, persuaded Edgar to remain on the East Coast. He went to work for Bellanca Aircraft but after only a month he decided to rejoin the NAA team in California. Unfortunately, that decision led to tragedy!

In Indio, less than two hours away from their destination there was a head-on car crash. Luise died at the scene and Edgar had multiple leg fractures as well as many lacerations on his face. He almost lost an eye. He was in the hospital for six months and another six months on crutches.

It was here that his NAA family closed ranks. The Richard Thaiss family took Rolf in while Edgar remained in the hospital. Almost every weekend, one of Edgar's NAA associates would take Rolf and drive up to visit him in Indio. Once he was out of the hospital, Chan King faithfully drove Edgar to and from work in his 1930 Ford roadster with the right door open and Edgar's leg out on the running board to allow for the huge cast on his leg. Rolf remains touched to this day by the compassion and care shown him and his father by so many wonderful people!

Edgar had a very difficult time dealing with Luise's death. It was not only the feeling of loss after all the years of separation but also the feeling of guilt, although the accident was clearly not his fault. His salvation was his work. He immersed himself in all the latest scientific studies and breakthroughs. It was during this period he defined his concepts for military aircraft. In 1936, Dutch Kindelberger promoted Edgar to Chief of Preliminary Design. They were both visionaries and they made a great team with Dutch on the selling end and Edgar on the design end.

In 1940, with World War II exploding, they were ready and the Mustang P-51 was born. Readers of the NAA Retiree News are familiar with the P-51 and its role in helping win the air war of World War II. However, the success of the plane would not have been possible without the leadership of these two men and the spirit of camaraderie and cooperation exemplified by such men as Dick Schleicher, Ed Horkey, John Young, Larry Waite and so many others, too many to mention, from test pilots to sheet metal workers. These men virtually lived the project day and night to get the first airplane designed and built in the legendary 100 days!

As Chief of Preliminary Design, Edgar, of course, was involved in the design of other NAA aircraft but it is the Mustang for which he is best remembered. When the war ended it was necessary to adjust and scale down to a peacetime economy. The pace and the pressure were gone and with them, the thrill!

In 1952, Edgar left NAA and accepted the position of Vice President of Engineering with the Northrop Corporation. There he played a significant role in the development of the T-38 trainer and F-5 fighter aircraft. In 1957, he was appointed to the Northrop Executive Committee where he felt too isolated from his first love, engineering. He resigned from Northrop.

He decided to go out on his own and, over the following years, was involved in a variety of ventures and consulting projects. These included a "throwaway aircraft" to carry individual soldiers over a battlefield and a method of reducing emissions from an automotive combustion engine. At 79, he went to Taiwan to teach young Taiwanese engineers how to design and build automobile engines. However, his health started to falter and he eventually moved to Oceanside, California where he was welcomed as an aviation pioneer.

Although not as well known today as he was during his active years, the technical community always recognized

ED SCHMUED/ Page 7

ED SCHMUED, continued from page 6

his contributions. Having served on the USAF Scientific Advisory Board, he was presented the Exceptional Service Award in 1962. He was also appointed a Fellow and, later, a Vice President of the Institute of Aeronautical Science, a Fellow of the Institute of Aeronautics and Astronautics as well as a Member of the National Advisory Committee for Aeronautics.

Edgar Schmued said he did not want to live if he could not work at his profession. On June 1, 1985, he died while in the midst of negotiations with Ryan Aircraft to perform some consulting work. He had lived a very productive life and had won the respect of his family, his associates and the pilots that flew his planes. In 1991, Edgar Schmued was invested in the International Hall of Fame at the Aerospace Museum in San Diego.

Editor's Note:
Ed Schmued in his early days at North American Aviation in the cockpit of an airplane on the right. Lest we forget, Ed was also the creator of the well known NAA logo, the famous flying bald eagle inside a triangle



THE P-51 MUSTANG WAR DIARY

January 11, 1944 – Mustangs were revealed for the first time by the Army Air Force as being in use as long-range fighter escorts for heavy bombers; although the P-5l Bs had been used as "top cover" for the bombers since December 1, 1943. The Mustangs flew with the heavies, estimated at close to 1,000, on a raid that virtually obliterated three German fighter plane assembly plants on the outskirts of Berlin. During the attacks on Oserschleben, Halberstadt and Brunswick, Mustang pilots shot down 15 enemy planes and damaged many more of the estimated 100 Nazi fighters that attempted to intercept the bomber formations.

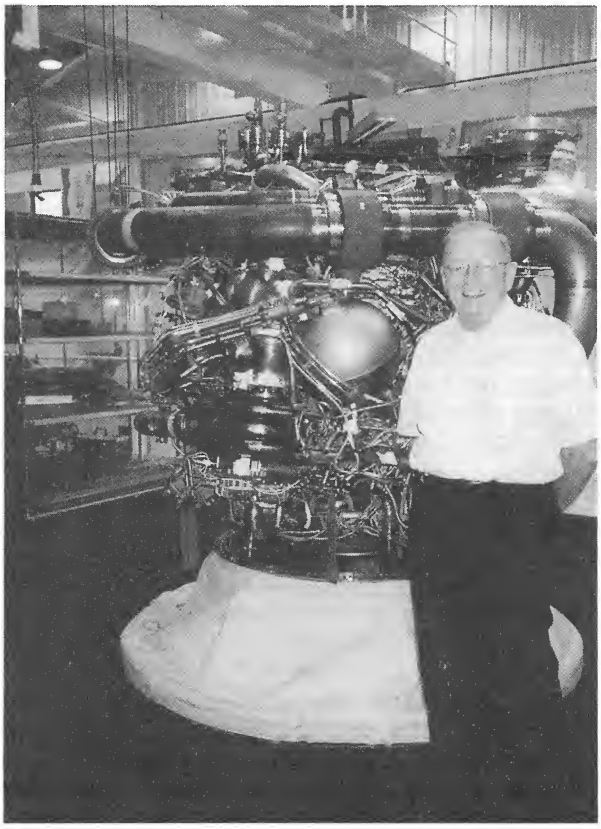
The Mustangs, led by Major James Howard, made the deepest penetration into Germany of any Allied fighters, flying more than 400 miles into the heart of the Reich. En route home, Major Howard distinguished himself by single-handedly protecting an entire combat wing of bombers from attacks by 30 Nazi planes. Separated from his unit, Major Howard dived and climbed and twisted in his Mustang through vertical miles of sky, firing at members of the Luftwaffe trying to reach the bombers.

When all of his guns but one had ceased firing, he bluffed the German pilots into breaking off their attacks, continuing his lone "flying circus" for a half hour precious time for the bombers. During his 30-to-1 battle, before he dove out of sight on the tail of a Nazi, Major Howard claimed two enemy planes destroyed, two probably downed and one damaged.

From "The P-51 Mustang War Diary" published by NAA in 1944.

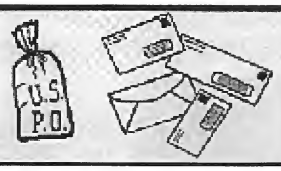
Doolittle's B-25s Over California!

Four North American Aviation B-25 Mitchell bombers were spotted last July on the Chino Airport ramp in Southern California .
They will be featured in the final moments of the forthcoming Disney movie "PEARL HARBOR". They will be used to recreate the famous Doolittle raid flown on April 18,1942.
Although the insignias and the bogus tail serial numbers correctly represent the B-25B block used by the Doolittle raiders, the planes are actually from the late 1944 B-25J series with a forward mounted dorsal turret plus waist and tail guns locations



ED RUSINEK at the Kennedy Space Center, FL
Seen here with one of the three Space Shuttle Main Engines removed from ATLANTIS for servicing at the Orbiter Processing Facility

THE MAIL BAG



By Andy Tindley (310) 325-6770

E-Mail: AndyOber@Juno.com

I Found It!

While picking up a prescription at the Fullerton Prescription center I found a fall issue of the North American Retirees Bulletin. I was delighted to find that you had picked up the publication as a function of The Bald Eagles.

I don't know that I am eligible to be a Bald Eagle, but I am anxious to be on the mailing list for the retiree news. While at the aircraft division in El Segundo I was in Human Factors doing escape system test work for the F-100, F-107, X-15, and the B-70. At the Space Division in Downey I was in Life Sciences doing test work on the crew equipment. I then returned to El Segundo, doing escapes systems and crew equipment testing. I retired in 1985 with twenty-six years or service.

I have missed the Retiree News. Thank you and your staff for making it available again.

Many Thanks,

Glenn Patton 1917 N. Lyon St.. Santa Ana CA. 92705
Tel: (714) 543-5762, glennpatton@msn.com

Andy's Note: Word of mouth is our only way to inform retirees about the revival of the Bulletin. Keep passing the word. Our Editor and staff wish we could have notified all prior subscribers, but it wasn't to be because of the way we went out of print with the Retiree News.

Warbird Round-up

I was very pleased to receive the Fall 2000 issue of the North American Aviation Retirees Bulletin and learn that the Bald Eagles, Inc. has picked up the ball in maintaining contact with alumni of one of the best companies in the world. Enclosed is a copy of my NAAR Membership Application to Val Yarbrough.

With regard to the 11th Annual "Warbird Round-Up" sponsored by the Santa Maria Museum of Flight, it was decided to re-schedule the event this year after Labor Day on September 8,9 and 10th to take advantage of reduced hotel/motel rates. It was reported that participation and attendance was significantly increased, although it was disappointing to note that only two P-51 Mustangs made it this year.

I believe that the Museum will plan next year's Round-up for September as well and suggest you change your "Annual Specials" accordingly. I would also suggest that you contact G. G. "Jerry" Brown, 243 Vista Del Monte, Anaheim Hills, CA 90740 - telephone (714) 749-6591 for some super pictures of this year's Round-Up for inclusion in the next issue of the NAAR Bulletin.

With warmest regards,

E.T. "Jake" Brown
1411 Via Rosa, Santa Maria, CA 93458-8319

Andy's Note: The Bald Eagles are not our sponsors. The publication from start to finish is still the volunteer staff with a subscription covering the costs. Please be patient with us as we are learning a slew of new things we didn't have to worry about previously, such as creating a data base, printing labels and having the Treasurer in one location and the data base and our office in other locations.

Praise For The Bulletin

I received the Fall 2000 NAAR Bulletin, Thanks. We would really miss all the great work all the staff puts in to getting it out.

I am sure that a lot of us appreciative readers would gladly become a lifetime member if invited. The price is right! You might think about this for your next issue. My check would be in the mail. Really!

Now the other reason for this note; my Zip Code is *93455-4903.* It was incorrect on last mailing (93458).

Thanks again for a job well done

Sincerely,

David C. Swann
761 Pattterson Rd. Santa Maria, CA *93455*

Andy's Note: The life time membership is $100.00 ; no invitation required to be a Silver Eagle.

Keep The Bulletin Coming

Hi Val,

We are happy to see that Boeing has not killed off everything yet. We retirees are still alive and active. I retired from Downey in January 1985, with 33 years time with the Company, including the entire Navaho Program, Hound Dog, Saturn II Booster, F-15 Proposal, B-1 Bomber, and the Space Shuttle. It was all in Mechanical Design in Engineering, doing what I wanted to do when Charles Lindbergh flew the Atlantic. I feel blessed to be able to work in my chosen line of work. Keep the Bulletin coming! Prior to NAA I had worked for Douglas at Santa Monica and El Segundo, Vultee at Downey, and Lockheed, Burbank. NAA was the best of the bunch.

Doug Alkire
220 E. Hellman Ave., Monterey Park, CA 91755-1201

Andy's Note: Boeing did in fact kill off the Retiree News. The budget was not extended and the Rec. Center land where our office was located, was sold off. The Corporate Giant did not feel that they should pay this expense when their other subdivisions such as Douglas and Boeing itself did not have similar publications for their own retirees.

A Satisfied Retiree

CONGRATULATIONS! The new North American Retirees Bulletin shows much excellent planning, scheduling and plain old leg-work.

Thanks for this dedicated job for us retirees.

With many good wishes.

Bob G. Yeamans
'67 Retiree Propulsion Systems
2048-A Via Mariposa East
Laguna Hills CA 92653-2261

Retiree Meetings

Thank you for listing the information about our old Downey Retiree meetings. Now meeting at the Union Hall on the 1st & 3rd Thursdays. The meeting time is 11 AM not 10 AM as listed in the fall Bulletin.
There are a few corrections needed. The Union Hall address is 14910 Garfield Ave., in Paramount, Calif., not 1410 Garfield Ave. in Downey, CA. The President's name is Bill Kelley not Bill Kelly. You can call him for info, at 1-714-637-9374.

About your new Bald Eagles Logo – since the Boeing Company doesn't support monetary (money) for the cost of paper, printing, & mailing of the Retirees Bulletin which is now supported by subscribers. Why don't you go back to the old NAA logo with the flying eagle? It's hard to tell what the new logo is. I've enclosed some logo examples you might use.
Thanks,

Joseph May, 6049 Graywood Aye, Lakewood, CA 90712-1156. Telephone: (562)920-9002

Andy's Notes: Thanks for keeping us up to date on our typos. Our readers now have the accurate information. We were not able to show your suggested logos but we did receive them. Thanks.

Retiree News Wanted

Hi Andy
This is from Don Dodson and we just had a conversation on the phone about the Retiree News and I would like to sign up if you can tell me how.
I sure hope I can get a copy of the Fall Issue and I will get some of the other guys to sign up too. If you will send me the information. Thanks a lot and you stay healthy and I will keep in touch with you. Thanks again.

Don and Mary Jo Dodson
mdodson342@aol.com.

Andy's Note: E-Mail response to Don gave him the information. He is also passing it on to some of the guys he plays golf with.

Tri-State Attendees

Andy,
It was great to talk with you this morning. This is the e-mail I promised and would appreciate it if you would add me to your address book. If you could send me email address of retirees that might be interested in using the myfamily.com web site, please send them to me.
Thanks again for the information....

Steve Carlson,
B-1 Palmdale stvnvee@email.msn.com

Andy's Note: We do not have a listing of others e-mail addresses except the few we put in the articles. The best we can do for you is to appeal to our readers to e-mail you and the you can retrieve the address.

Napa's Pete Kreider

That headline should have appeared in the Fall edition, not Ohio's Pete Kreider. When I was going through the mail bag column and inserting headlines I looked at the address of the article just prior which was a Ohio address. Shame on me for not catching the error while proofing.

Doug Alkire Remembers Joe Cobb

Dear Editor Juif,

The Fall, 2000 issue of the "Bulletin" carried an article on Page 7, which really caught my attention. My path crossed that of Joe Cobb in mid-1927, although I never actually met him face-to-face. I have not forgotten, and have never had the opportunity to thank him. I will, do it now, with the hope that he will read about it in the "Bulletin".

Here is the story: In 1927, during summer vacation, my dad paid for a two-week stay for me at the Alhambra YMCA camp with the Indian name "Ta Ta Pochon". The camp is located at Barton Flats, in a Primitive Area, a few miles South of Big Bear Lake. I was 9 1/2 years old, and it was my first stay away from home.

At the end of the fun-filled two weeks my dad brought the rest of our family up to take me home. While visiting with the camp leaders he discovered that Joe Cobb had arrived with his mother for the next camp session. Joe immediately became sick and his mother decided that she must take him back home.

Since his stay was already paid for, and it was too late to get a replacement camper up from the city, she offered his berth to my dad. He accepted the offer, which was free, and looked me up to tell me the good news.

Joe and his mother were already gone, so I did not have a chance to thank them. I have never forgotten the generosity and want to thank Joe for his part in it. I wonder if he remembers the incident?

I was never a movie actor except in my own home movies but I did serve as a sort of "Stand-in" for Joe for two weeks. He worked at North American for 30 years, and I worked for North American for over 33 years. so we did have some years overlapping where we were both at NAA for 21 years.
Keep up your excellent work, Michel, it is really appreciated.

Douglas Alkire,
220 East Hellman Ave., Monterey Park CA. 91755-1201

P.S. John Markel and I worked in the same group in Airframe Design in the early 50's. Several years ago I wrote to him at your office, but received no response. John, I have not forgotten you.



HERBERT ZIEGLER (ZEKE) HOPKINS was born on March 25, 1926. He passed away in September 28, 2000. He graduated into the Army Air Corps as a pilot from the USMA at West Point in 1946. In 1949, he received a Masters Degree in Aeronautical Engineering from Princeton University. He served as a Flight Test Engineer at Wright Field for two years, and was sent to Edwards AFB to attend the USAF Test Pilot School. In 1955, he accepted a position as a North American Aviation Engineering Test Pilot flying prototypes of the F-100 and A3J. Zeke was promoted, in 1962, as Chief of the XB-70 Flight Operations. He left North American Aviation in 1966 to accept the position of Director of Operation for Filper Research. Finally he joined McDonnell Douglas in 1968 as a Project Engineer and Program Manager on the DC-10 and T45-TS. He retired in 1991

BAKER, LUCY - died in Torrance, CA on September 26, 2000. Lucy retired after working 31 years in Plastics. Ken Fowler, who learned of her death from the obituary in the Daily Breeze, notified us.

CARPENTER, ALAN B., - 82 of Yorba Linda, CA an industrial engineer, died on September 30, 2000 of cancer. Al worked in Industrial Engineering at Autonetics and Space Division. Maxine Haun notified us.

CREACH, JESS, 84 1/2, passed away on November 12, 2000 in Torrance Memorial Hospital. JESS retired from LAD where he was a design checker in Tool Design on the B-1 program. Reported by Dumont Wing, a good friend.

HARCOURT, FRED, 70 - of Brea, CA died February 18, 2000 of complication from diabetes. Fred worked at Rockwell International as a Material Contract Manager. Information obtained from an obituary

KELLEY, LEON E., 65 - of Redondo Beach, CA passed away on September 25, 2000. He retired from North American Aviation after 39 years. Information from an obituary in the Daily Breeze.

LEWIS, GEORGE, 84 - passed away September 22, 2000 of heart and kidney failure. George was hired in 1936, he worked in Tooling Division at LAD and served as Tooling Superintendent for many years. Ted Ryan and George Wiley notified us.

NETHERTON, BILL –long time tooling employee, passed away on August 23, 2000 after a long struggle with emphysema. Bill worked fro the company from 1951 to retirement in 1982. He worked on many programs, the latest being the Apollo and the B-1. Rex Tabor notified us.

PORTER, JANICE - passed away in August. Janice worked in Production Planning and Production Control for more than 35 years. Her family notified us

REED, DAVID ARTHUR JR. , born in October 19, 1919, passed away on October 8, 2000 of natural causes. He worked in Engineering at North American Aviation. He retired from North American Rockwell in 1982. Information obtained from an obituary sent by Maxine Haun.

RIDHEART, WILLIAM H. "Bill" - passed away at his home in Lancaster, CA on June 10, 2000. Bill worked for North American Rockwell for 39 years. He started at the Columbus Division as an Aeronautical Engineer, he then transferred to LAD. He also worked at Edward AFB. He retired in 1982 as an Instrumentation Engineer. Joe M. Ozment, a retired Engineer from Palmdale, who now reside in Selmer, TN notified us of Bill's death.

ST. CLARE, C. KENDRICK , 79 - of Fullerton, CA, a supervisor for Rockwell International, died on September 20, 2000 of cancer. Information obtained from an obituary in an Orange County newspaper.

SUTTON, REX STANLEY, 81 - died at Western Medical Center in Irvine, CA on September 30, 2000. Rex worked at LAD in design and management positions in Engineering on many programs including the B-1 and the Sabreliner. Information obtained from an obituary in an Orange County newspaper.

THOMAS, HANNAH MAE, the mother of **VAL YARBROUGH**, RB Treasurer and Chairperson of the Bald Eagles, passed away at the age of 99 on November 2, 2000 of natural causes. Hannah was born on August 21, 1901 in Rocky Ford, CO. On behalf of the Bulletin Staff and the Bald Eagles directors we extend our sympathy to Val for the loss of her loved one.

THE BALD EAGLES, INC. PAGE

BALD EAGLES ANNUAL REUNION

THE 39th ANNUAL BALD EAGLES REUNION WILL BE HELD ON SATURDAY, APRIL 21, 2001, AT THE PROUD BIRD RESTAURANT, 11022 AVIATION BLVD. (AT 111TH STREET). DOORS OPEN AT 10:00 AM FOR VISITING. SEATING FOR LUNCH AT 12:00 NOON.

IF YOU PLAN TO ATTEND, SEND A CHECK PAYABLE TO BALD EAGLES, INC. FOR $20.00 FOR **EACH MEMBER IN YOUR PARTY** TO:

VAL YARBROUGH
520 DEL ORO DRIVE
OJAI, CA 93023-1805
TEL: (805) 646.2283

INCLUDE WITH YOUR CHECK THE NAME(S) AS THEY SHOULD APPEAR ON THE BADGES FOR EACH PERSON FOR WHOM YOU ARE ORDERING TICKETS.

TICKETS AND NAME BADGES WILL BE HELD AT THE ENTRANCE.
THE BALD EAGLES REUNION AREA WILL BE CLEARLY MARKED.

SORRY, THERE CAN BE NO REFUNDS AFTER APRIL 2, 2001.

THIS IS THE ONLY NOTICE YOU WILL RECEIVE ABOUT THE EVENT. SHARE THIS NEWS WITH OTHERS WHO HAVE AN INTEREST IN NORTH AMERICAN AVIATION/ROCKWELL, ITS HISTORY, AND ITS EXTRAORDINARY HERITAGE OF PRODUCTS AND PEOPLE. THERE IS NO MINIMUM COMPANY SERVICE REQUIREMENT FOR ATTENDANCE - - JUST $20.00 AND AN INTEREST IN THE COMPANY AND ITS PEOPLE. WHAT A GREAT TIME TO SEE OLD (AND NOT SO OLD) FRIENDS!

SEE YOU THERE.

Farewell
20th Century

WE THE WILLING LED BY THE UNKNOWING
ARE DOING THE IMPOSSIBLE
FOR THE UNGRATEFUL.
WE HAVE DONE SO MUCH FOR SO LONG
WITH SO LITTLE
WE ARE QUALIFIED TO DO
ANYTHING WITH NOTHING.
The Retiree News Staff

Hello
21st Century

As we are closing the 20th century, the above verse summarizes our endeavor, over the past decades, that we so diligently and faithfully devoted to the Retirees of NAA and Rockwell. ***Happy New Year everyone!***

Retirees Bulletin Office
2600 Westminster Blvd.
PO Box 3644, M/C SJ 51
Seal Beach, CA 90740-7644

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RETURN SERVICE REQUESTED

Can you identify these WWII aircraft?

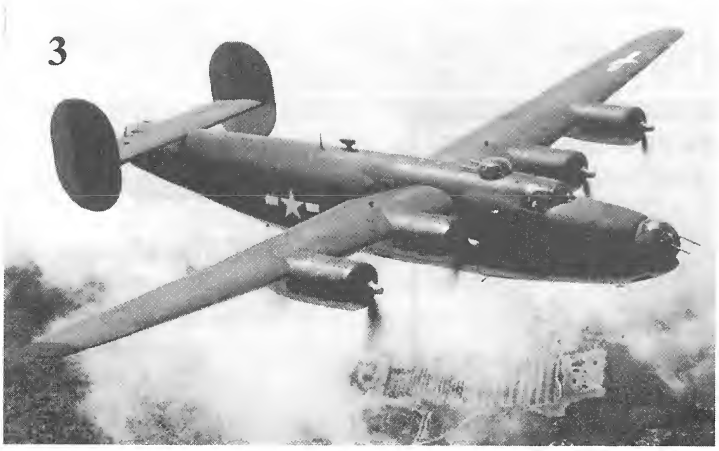
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Answers can be found, somewhere, inside this issue.

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION

Retirees Bulletin

SPRING 2001

Inside:

NAVAHO, A BLUNDER OR A LEGACY, by JAMES GIBSON

Author of two books, THE NAVAHO PROJECT AND NUCLEAR WEAPONS OF THE UNITED STATES. James Gibson is a Material and Process Engineer at the Boeing Huntington Beach Division, along with his sister, Beth, a Structure Engineer. He has worked on the Space Shuttle, ISS and Delta launch vehicles projects.

DUTCH KINDELBERGER'S DREAM TEAM—Centerfold



The NAVAHO X-10

NAVAHO X-10 No. 1, Tail Number GM19307, on the ramp at Edward Air Force Base. During its fourth test flight on March 31, 1954 the vehicle hit Mach 1.47, easily outpacing the fastest chase plane available at the time, the NAA F-100 SUPER SABRE.

NORTH AMERICAN AVIATION
Retirees Bulletin

DEAR NAA RETIREE BULLETIN SUBSCRIBERS

We sent out 9000 copies of the Winter Issue. At first, it appeared to be an insurmountable task. As a final gesture of good will, Boeing provided us with a printout of 8300 retiree addresses with a heat activated glue on the back. Our group of volunteers cut up the sheets into individual labels and ironed them on the bulletins. We then sorted them by zip code and delivered them in two batches to the post office. Once the bulletins went out, we got worried. Supposing after all of that, nobody will care to even respond! We needn't have worried. Once you worked for NAA, you are family!

The response has been tremendous! The words of appreciation and the checks just poured in and continued to come in as we prepared this edition. The requests for Silver Eagle membership came in such number we had to make a special space just for them. A special note from Bill Halpin who sent us a check for $ 500.00 capped this. Although he modestly refused the title, we nominate him as a Golden Eagle!

We also have over 400 Bulletins returned because of obsolete addresses. Some had the new addresses attached and we re-mailed these to the new addresses. The others remain stacked up and undelivered. Sadly, we also learned of the passing of many, too many, of our retirees. We salute those family members one last time in the Silent Majority.

When your letters started coming in bundles with your subscription checks, we realized we had another logistics problem converting all this data into mailing labels. This included the more than fifty gift subscriptions that you ordered. As usual, the NAA family always has someone to step in and take up the slack. Sonnie Robertson came from her beautiful home in Canyon Lake, CA and took over the task of preparing the subscription mailing lists and labels.

Thanks to the generous cooperation of Rolf Schmued, we also have a centerfold that we think will inspire you. In the late 1930's the nation was coming out of the Depression. There were some long time aircraft companies around and a young upstart called North American Aviation. As the nation prepared for war and then entered World War II, that name became synonymous with the best aircraft in the world. The faces that you will see in the centerfold represent much of the reason for that logical and indisputable conclusion.

Having said all that, we thank all of you for the wonderful support that you have given us in words and money. Please keep in touch and let us know what you are doing! Many of you have some great stories to tell! Share them with us. We may not print them all but rest assured that they will be read and enjoyed.

NAAR is an affiliate of the **Bald Eagles, Inc.** and is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAAR office is located at Boeing, Seal Beach facility. Send mail to:
Retirees Bulletin Office
2600 Westminster Blvd
PO Box 3644, M/C SJ 51
Seal Beach, CA 90740
Or call: ☎ (562) 797-3836
Or Fax: (562) 797-3848

NAAR Staff
(562) 797-3836

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MEMBERSHIP FORM

RETIREES BULLETIN OFFICE
PO Box 3644, M/C SJ51
Seal Beach, CA 90740-7644

Yes, I am a retiree of NAA/Rockwell and I want to be a member and receive the NAA Retirees Bulletin. I am enclosing a check payable to the Bald Eagles, Inc. for $ _____
For every $10.00 I will receive four issues.

Name _____
Street Address _____
City/State/Zip _____

I retired from_____ Division
After _____ Years of Service

You may also send a gift subscription to another NAA retiree.

Just give us the name and address of the recipient along with your payment and we will send a gift card to him

THE EAGLE FLIES AGAIN

With this first issue of the 21st century and by popular demand we have resurrected the old famous logo designed by Ed Schmued, that has flown with all the NAA built aircraft since before World War II and for many years after. It will be, from now on, our logo which is displayed where it rightly belongs, with North American Aviation on the front cover. The logo is still legally a registered trademark for North American Aviation Inc. However, since the company ceased to operate on its own and was absorbed by other corporations for the past twenty years, permission from the corporation to print the logo is no longer a factor, it can still be used legally with the words "North American Aviation"

DEAR BULLETIN READER

If this copy of the NAA Retiree Bulletin that you are reading was not obtained as a result of a gift subscription or you picked it up as a "freebie" at the Employee Prescription Center, take a few minutes to fill out the membership form on the left or a facsimile and send it to us with your check for $10.00. That way, you will never miss an issue.

NAA/ ROCKWELL/BOEING RETIREE CLUBS and GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Bill Kelley at (714) 637-9374
TheAntelope Valley Retiree Club meets at 10:00 AM every 2nd and 4th Monday of the month at the Palmdale Fitness Center. All North American retirees are welcome. For more information call (805) 265-3488.
The Boeing Valley Retiree's Club meets on the 3rd Thursday of each month at the Canoga Park Rec. Center. 8500 Fallbrook Ave. Canoga Park, CA. President: Jennie Muncaster, dial (818) 341-8919
Autonetics Retirees meets for lunch at 11:45 AM on the 2nd Wednesday of each month at the Rembrandt Restaurant, 909 E. Yorba Linda Blvd., Placentia CA. All Autonetics retirees, spouses and friends are invited.
"Ye Olde Pharts Breakfast Club" meets for breakfast the 4th Thursday of each month at Coco's on Tustin Ave. and Lincoln Blvd. In North Orange.
A group of NAA Retirees meets for breakfast on the 1st Wednesday of each month at the Knott's Berry Chicken Farm Restaurant at 8:15 AM. All are invited.
A group of Retirees from Seal Beach meets at 11:30 AM at "The Fish Co", Los Alamitos and Katella, on the 3rd Wednesday of each month. For more information, call Marvin Blaski at (714) 848-5717 or e-mail: mblaski@aol.com
"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meets for lunch on the 2nd Wednesday at 11:30 AM at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd and Mariposa Ave.
"The Old LAD Stress Group" meets approximately every two months at Mimi's Café in Torrance, CA for breakfast. If you were in the old LAD Stress Group and want to join them, contact Gene Laxton (310) 378-3113 or Ed Rosenthal at (310) 375-8933
The Downey Engineering Group of Retirees known as "The Choir Boys" meets every Thursday for lunch at various restaurants from Seal Beach to Downey. Call Al Risi at (714) 892-5725 for meeting location.
GPS Breakfast Club meets every Wednesday morning from 6:00 to 8:00 AM at the Primrose Restaurant at the corner of Seal Beach Blvd and Westminster Blvd. All are invited, retired or not.
The Facilities, Industrial Engineering and Plant Services Retiree Group meets on the 2nd Thursday each month at the Jolly Roger in the Long Beach Marina at 11:45 AM. Friends and wives, former and current employees are welcome.
The North American Rockwell Retirees Club of McAlester Oklahoma (a satellite of Tulsa, OK) meets each month on the 3rd Tuesday, 10:30 AM at the Down Town Meeting Place. For more Information contact:
J. A. Darden, 343 W. Adams Ave. McAlester, OK 74501 or phone (918) 423-0706.
Tulsa & McAlester Retirees meet for breakfast at 8 AM on the 2nd monday of March, June, September & December at the Harvest Buffet, 3637 S. Nemovial Drive, Tulsa. Call Harry Phillips for more detail at (918) 838-3716.
The North American Rockwell Retiree Group of Columbus, OH. Engineers and Professionals meet each month on the 3rd Thursday at 11:30 AM at the Berwick Park House. For more info. contact Byron C. Solomides at (614) 486-3239.
NAA/Rockwell U.A.W. Group of Columbus, OH, meets on the 1st Monday of each month at Noon at the Old Rockwell Park (North Hamilton Rd.) E. Hamilton at (740) 927-5940.
Autonetics Group that includes Marine Systems, Program Office, Project Office, System Test, Engineers, Designers, etc. meets for lunch on the last Wednesday of each month at the Hometown Buffet, Rose Avenue and Alta Vista Drive in Placentia. For more information call Mike Vohs at (714) 762-1925.
A group of NAA Retirees from 101 Tooling meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at the Cimarron Café at 5160 190th St., West of Anza Avenue in Torrance.
Autonetics Finance Luncheon. This group meets for lunch the last Wednesday of the month at Carrow's located at 100 N. State College in Fullerton. Anyone interested can call Ken Cantwell, at (714) 970-7171 or send e-mail at: kcantrell@prodigy.net, to obtain more information.
Autonetics Industrial Engineering and Maintenance Retirees meet for lunch the 1st Thursday of each month at the Hometown Buffet, 390 McKinley, located in front of Home Depot, in Corona. For more information call Don Burt at (909) 698-0072
NAA Tech Reps Assn. (TRA) Breakfast Club meets the 1st Tuesday of each month at the Carlsbad Airport Restaurant at 9:00 AM.
For more information call: El Presidente, Rafael Colunga at (760) 940-0525
A Group of Engineers Mgt. , meets on the 3rd Tuesday monthly at Denny's on Imperial Hwy and 57 Fwy. at 11:30 AM for lunch. For more information call Ed Moran at (562) 697-9949
Autonetics Flight Control Retirees meet on the 3rd Thursday of every month, except December, at 11:30 AM at "The Lamppost Pizza House" located at 17568 Yorba Linda Blvd. corner of Richfield Road in Yorba Linda.
Call Jim Anderson at (714) 779-5620 for more information.

ANNUAL SPECIALS

The "Warbird Round-Up", sponsored by the Santa Maria Museum of Flight - August, 2001
Bald Eagles Reunion - The 39th Annual Reunion is on April 21, 2001, call Val Yarbrough at (805) 646-2283
Grants Pass Picnic - 1st Wednesday after Labor Day, September 5, 2001
NAA-K B-25 Reunion is held yearly at the Wyandotte County Museum. For more information call Harry J. Desko (913) 287-7223 or write to him at 3024 N. 47th St., Kansas City, KS 66104.
Flying Horsemen For year 2001, information regarding events and reunions may be obtained from the troop secretary, Harold Shapiro at (714) 993-3496, FAX (714) 993-1208, e-mail shapsplace@aol.com or mail to 17822 Kennon Dr., Yorba Linda 92886
The Hangar Gang - This group of retirees meets approximately every 6 months. For time and date or additional information call Gene Salvay (818) 788-3974, or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.
Annual Flight Test Instrumentation Reunion - This group of retirees meet annually at the Fullerton Elks Club. For Information call Ed Mosbrook at (714) 531-8060 or Frank Vigil at (562) 691-0236.
Tech Rep Association—a group of retired Field Service Technical Representatives has a yearly picnic in June at the park in Fallbrook. For more information, contact the TRA President Rafael Colunga, 5705 Redondo Dr., Bonsall, CA 92003 or at his e-mail address: rafael@nctimes.net
The Annual M&P, P.D.L., "Friends Christmas Luncheon". This group of retirees (and some still employed) have assembled in mid-December for a festive luncheon and gab-fest for the past 18 years. The last two luncheon were at South Bay Grill and Luig's.
Those wishing to receive notice of next December Luncheon, please call Fred Koeller at (310) 545-8854.
2001 Group Reunion Luncheon for TRI-STATE Members - This group will meet on Wednesday, October 17, 2001at 11:00 AM to 3:00 PM (PST) at the Lancaster Elks Lodge #1625, 240 East Avenue K. Lancaster, CA 93534. For reservation call one of the committee member : Bill Bright at (661) 943-7276 or Steve Carlson at (661) 944-9698 or Jim Beall at (661) 945-1326
E-mail: bbright@hughes.net E-mail: Stvnvee@msn.com E-mail: jjbell@as.net

Continued on page 4

The Editor's Corner

U. S. SAVING BONDS HAVE LIMITS!

As part of our responsibility in working in a defense industry all of us at one time or another signed a weekly payroll deduction card for U.S. Savings Bonds. Since there was no tax to be paid until the bonds were cashed, this proved to be a good way to save for a rainy day. As the years slipped by, the bonds accumulated and, if an emergency did not arise, provided a substantial "nest egg" to be cashed in at some later date after we retired.

Since the U.S. Treasury had a tendency to adjust the nominal Original Maturity date for the Series EE bonds pending when the bond was purchased, it was easy to ignore this date when the bond reached its face value because it continued to earn interest. There is, however, a Final Maturity date which defines the date when interest payments stop and penalties begin!

Without a major analysis of each individual Series EE group that was issued over the years here is a simple rule. The Final Maturity date for all bonds issued before Nov. 1965 is 40 years. For all other bond groups issued later, it is 30 years. If you are holding individual Series EE bonds approaching these limits, consider cashing them in or rolling them over into Series HH bonds.

If you don't, the consequences may be costly. Firstly, the Series EE bond no longer earns interest. Secondly, under IRS rules, the tax is due on the interest in the year when the bond is cashed or it reaches Final Maturity. If you hold the bond beyond 12/31 of the Final Maturity year, you will not only owe taxes on the interest but also additional interest and penalties. Thirdly, once the bond passes its Final Maturity date, you cannot roll the proceeds into a tax postponing Series HH bond.

For further information, you may call:

1-800-4US-BONDS or 1-800-487-2663.

BOEING OPENS NEW PHYSICAL FITNESS CENTERS

In the coming months, Boeing will open two new fitness centers on Boeing property for the use of employees, retirees and their dependants.

Scheduled to open in April, the Anaheim center will be on Miraloma, just behind the Employee Prescription Center. The 12,000 sq. ft. facility will include a complete line of fitness and weight lifting equipment, onsite programs such as aerobics. Outdoor amenities will include a basketball court, two tennis courts, a running track and a multi-use soccer/flag football field.

Scheduled to open in June, the Huntington Beach center, a 16,000 sq. ft. complex will include all the same features plus two baseball diamonds.

Both centers will be outside of the security areas and will be available to retirees and dependants

Send us mail for the Mail Bag—Andy Tindley is waiting for your letters. Also don't forget that you can put ads in the Mail Bag if you have something that you want to sell or that you want to buy (No charge for this service, OK!).

MISCELLANEOUS INFORMATION

All NAA / Rockwell / Boeing Retirees that have a need to contact the BNA Benefits Center must have their Personal Identification Number (PIN) available before attempting a call to the Center.

The telephone Number is 1-800-438-3116. The business hours are from 10 AM to 6 PM (EST) M through F.

If you don't have one or forgot your PIN, you must write to the Center:

BNA BENEFITS CENTER
PO Box 24567
Jacksonville, FL 32241-4567.

Services provided by the Center are:

Life events, enrollment or change in medical/dental plans, address changes, plan comparisons of medical benefits, answers to general health/dental/vision and life questions, health care/Life Insurance direct billing procedures and confirmation statements.

The above information does not apply to retirees from the Rockwell Corporate Offices. These former employees remain under the Rockwell Corporation benefits and pension plans

Other Services Available to Retirees

Only the Boeing California Employee Fitness, Inc. location at Seal Beach is available to Retirees. To access the facility, retirees must exchange their Retiree Card for a temporary badge at Gate 510 on Westminster Blvd.

Discount tickets to recreation parks are no longer available at the Fitness Center. However, there is another source available.

Employee Services discount tickets:

www.Boeing.esvp.com/, if you have internet, if not: call 1-877-641-7283

Retirees on tours wishing to rent a car can benefit from the Boeing Corporate Discount.. The company negotiated contract agreements are:

No. 5555501 for National and No. 147616 for Alamo.

Refer to the pertinent number when negotiating a rate for car rental at National or Alamo. Have your retiree ID card with you all the time

NEW OFF THE PRESS

A book called: "THE NAVION" by C.C.King

The book written by C. Chandler King, a member of the original design team at North American Aviation, contains wealth of original data including pilot reports, problems early dealer and customer comments about the design, and performance of the test airplanes including the acceptance test at Wright Field of the first L-17A.

Because of his background the author has personal authentic knowledge about the program from the day it started and, where gaps existed in his memory, he had access to others who were there including Lee Atwood, a personal friend, and Ralph Ruud who had invaluable help to give.

The book has an extensive appendix, which includes early articles about the airplane, and much more.

The binding is of the type that stays open easily so you don't have to fight to read the inside of pages or see all of a picture. It is an original of 120 pages plus 60 or so for the Appendix. The price is $28.00 including tax and S and H.

To order contact C.Chandler King either by e-mail at: opanavion@aol.com
Or in writing at: 340 Old Mill Rd. #54, Santa Barbara, CA 93110-3718

The Rockwell Federal Credit Union has recently changed its name to:

Financial Partners Credit Union

The former RFCU has been converted from a Federal to a State Chartered Credit Union. The main office is located at 7800 East Imperial Hwy in Downey, CA
For information and business hours, call 1-800– 950-7328

CALENDAR OF EVENTS (Continued)

REMINDER:

The Bald Eagles Reunion is on April 21. Please, make your reservation and send your check in the amount of $20.00 to Val Yarbrough, now.

NAVAHO, A BLUNDER OR A LEGACY

BY JAMES N. GIBSON

THE LEGACY

When the Retiree News asked me to write about the legacy of the NAVAHO, the first question that came to mind was how to really express what this program truly accomplished. According to military history, it was a complete failure! After the expenditure of millions of dollars and ten years of research, development and testing, the program was cancelled during the testing of the intermediate sub-range version. Considering how some historians felt about the program, it is surprising that the History Channel hasn't run a NAVAHO episode under its Great Military Blunders series.

Of course, many of these programs were blunders. However, I know that the NAVAHO program was anything but a blunder or a waste of money. It may never have been deployed as a weapon system, but the groundwork it laid for the later APOLLO program and our nation's space achievements were extraordinary. It caused more advancement in aerodynamics, propulsion, materials and electronics than any program before it and quite a few since. NAVAHO was a program that truly was worth more in its parts than as a total vehicle.

ROCKET PROPULSION

Liquid fuel rocket propulsion was an early spin-off of the NAVAHO program. The Rocketdyne Division of North America Aviation built almost every high thrust rocket engine developed in the 1950's, and the entire Rocketdyne division was developed as a result of the NAVAHO program requirements. Without NAVAHO, there would never have been a Rocketdyne and the entire U. S. space program would have been completely different.

One engine developed directly for the NAVAHO project was the engine used for the Redstone missile. This engine was originally developed for the NAVAHO One vehicle, also known as the NA-704. When this missile was superseded by longer-range NAVAHO concepts, the engine became available to Von Braun and his team of engineers working on a vehicle called Ursa. Now with a proven engine, the design advanced quickly from concept to development and on 20 August 1953, Ursa, now renamed Redstone medium range ballistic missile was launched.

Three years later, a modified vehicle, called Jupiter A, set a free world flight distance record of 3,000 miles. With just a little extra fuel (or thrust) the vehicle would have reached orbit a year before the Russians launched Sputnik. Unfortunately, due to the politics in 1957, NACA selected the Redstone as the secondary launcher for the first U.S. satellite.

After the pad explosion of the Vanguard missile on 31 January 1958, another Redstone variant, Jupiter C, launched Explorer One. This success pushed further uses of both, the missile and its NAVAHO engine. These included the launch of Explorer III and IV and, in 1961, Astronauts Alan Shepard and Gus Grissom in the two Mercury sub-orbital missions.

Thus, in just one issue, a rocket engine built for an earlier NAVAHO variant was eventually used to place the first American astronauts into Space.

JUPITER, THOR and ATLAS

The rocket engines used by the Jupiter and Thor IRBM s and the larger Atlas ICBM were also the results of the NAVAHO program. The NAVAHO program pioneered the Liquid Oxygen/ Kerosene fuel mixture that was used by these later vehicles. Outside of their military applications, these vehicles were the foundation for much of America's current space program.

The Jupiter, in its Juno configuration, launched the deep space probes Pioneer III, IV and VII. The Thor-Able and the subsequent Delta have set the standard for satellite launch reliability. Of course, the Atlas also carried the first major communications satellite and, on 20 February 1962, Astronaut John Glenn into earth orbit.

In addition to these engines, NACA asked Rocketdyne in 1958 to develop an advanced version of the Jupiter engine for a special project. The plan was to develop a high thrust rocket to place a three-man crew into high earth orbit. The designation for this engine would be H1, and the vehicle that would use it was the Saturn SIB. Further upgrades, plus components from the Atlas engine, would result in the RS-27, the engine currently used in the Boeing Delta II and III launch vehicles. In simple terms, engines whose foundation technology can be traced to a military missile "blunder", are placing the majority of America's satellites in orbit today.

Development of the H1 was not the end. Soon after its development began, development of the largest LOX/Kerosene engine also began. Called the F1, five of these engines lifted the enormous Saturn V moon rocket off the pad. Thus, the Fl engine became the grandchild of the NAVAHO vehicle.

GIMBALLED ROCKET ENGINES

The G-38 booster engine developed for the operational NAVAHO design would also be the first large rocket unit to have gimbaled engines. Prior to this, the means used to vector thrust was to place jet vanes in the engine's exhaust stream or to use vernier engines. These vanes were inefficient and eroded during engine burn, reducing their effectiveness during flight while the verniers consumed fuel and created their own reliability issues.

This maintenance of effectiveness throughout flight would make thrust vectoring the primary directional control system for later manned space vehicles. From the Saturn V moon rocket to the three-engine cluster of the Space Shuttle, gimbaled engines are another legacy of the NAVAHO program.

INERTIAL GUIDANCE and ELECTRONICS

The NAVAHO program pioneered the development of both fully inertial guidance and the airborne digital computer. Originally, NAVAHO was to use a stellar inertial system. As the program progressed, however, a true inertial system with excellent accuracy and reliability was conceived. Such systems immediately found application outside the NAVAHO in Navy submarines.

In addition, this improved guidance system used a transistorized flight computer. Though not the first solid-state electronic device, it was far more sophisticated that the portable radio that preceded it. One of the improvements included the creation of replaceable modular circuit boards. Now, instead of checking every diode and capacitor when a failure occurred, the board in question was simply removed and replaced with a new board. This concept also allowed the incremental upgrading of the system by the replacement of one or more boards. It was the dawn of high reliability/easy maintenance electronic systems used throughout the modern electronic industry.

To support the demand for solid-state computers and inertial navigation units, a new division, called Autonetics, was founded and located in Anaheim in November 1955.

HIGH SPEED AERODYNAMICS

The NAVAHO project affected High Speed Aerodynamics research in several ways. The first was the development of the small Super Sonic Wind Tunnel at the North American Aviation Los Angeles Division. Begun, to gather data on supersonic flight for early NAVAHO designs, it later was used to gather data for other NAA aircraft designs.

NAVAHO - continued page 6

NAVAHO - continued from p. 5

In addition to the SSWT at Los Angeles, a hypersonic test tunnel was built at the Rocketdyne facility at Santa Susanna. Hypersonic flight data was essential for the development of vehicles such as the NAVAHO G-26, at Mach 3, and the G-38 at Mach 3.25. Subsequently this research was used in the design of the NAA F-108 and XB-70. It also gave NAA an edge in winning a significant NACA program.

X-15

In 1954, NACA and the Air Force called for proposals for a Mach 3+, 60,000 ft+ test aircraft. Bell Aircraft and Douglas, builders of the X-1 and the D-558, submitted design proposals. Though not a primary competitor, North American Aviation also submitted a design for this vehicle. Having no previous experience making rocket planes, the high speed research data accumulated from the NAVAHO gave NAA the edge it needed.

The design proposed by NAA was superb! Not only was the vehicle capable of achieving Mach 3, but it could reach Mach 5. Flight altitude was also extended from 60,000 ft to 100, 000 ft. In December 1955, the Air Force accepted the proposal and construction began in 1956.

Three X-15s were constructed with the first one flying in 1959. The three vehicles set many altitude and air speed records before the program ended in 1968. These included an unofficial world speed record of Mach 6.7 and an altitude record of 314,750 ft.

RAMJETS and SCRAMJETS

An important factor to keep in mind about the X-15 is that it lacked range. If a large ramjet or scramjet was available, it could have flown from the United States to Japan in less than two hours.

The NAVAHO program still holds the world record for the largest flight-tested ramjets. With their four-foot diameter Wright Aeronautical ramjets, the G-26 and G-38 actually are one of the stepping-stones for the long researched Orient Express, or NASP, aircraft. This fact drives the continued research into the combustion ramjet or scramjet powerful enough to power a NASP sized vehicle.

Data on the NAVAHO ramjets is limited and current Air Force control of NAVAHO documents indicates this will continue for some time to come. It is known, however, that the NAVAHO program included several concepts involving solid fueled ramjets ands ramjets burning "ZIP" fuel for long range and high thrust.

In addition to the wind tunnel data, the research gathered from the X-10 and G-26 flights increased our knowledge of high-speed parasite drag, wave drag, aeroelasticity and thermal heating. This was subsequently used to design more efficient aircraft with improved speeds and greater ranges.

MATERIALS and FABRICATION

NAVAHO broke new ground in the methods for handling lightweight materials and the construction of lightweight/high strength materials.

On the subject of materials, NAVAHO, literally, created and stabilized the titanium industry. These applications later found their way into the design of the SR71, Apollo, Space Shuttle and most modern space vehicles. The NAVAHO program helped to establish bonded aluminum honeycomb; then called plymetal. Today, this material is used throughout the aerospace industry in both civilian and military applications.

Chem-Milling is another gift of the NAVAHO program. The ability to sculpt integral structure into skin sections found extensive use in the Apollo program where every ounce of weight was critical. Until the advent of CNC machine systems, it was a regularly used process to reduce metal components to the absolute bare minimum required.

Heli-arc fusion welding of aluminum and stainless steel is also a fundamental by-product of the NAVAHO program.

INFRASTRUCTURE

The final legacy provided by the NAVAHO to America's Space Program was the creation of its divisions. At the time North American Aviation started the NAVAHO program there were two divisions: Los Angeles and Columbus. By the time it was over, the company had five highly skilled and motivated divisions.

Rocketdyne today is still the premier liquid fuel engine manufacturer in the United States; it presently is making the RS-68 engine for the new Delta IV vehicle. It also supports the Space Shuttle Main Engine SSME effort, the continued production of the RS-27s for the Delta II and the Linear Aerospike engine for the Lockheed X-33.

Autonetics still makes inertial guidance systems for various applications. It supports the Minuteman Missile program, the Navy's Submarine Launched Ballistic Missile system; the GPS satellite system and other efforts.

Finally, the Missile Division at Downey, California has served this nation well. It was the assembly site for the Apollo command and service modules, the integration site for the Apollo-Saturn V moon vehicle and the design and fabrication site for the Space Shuttle Orbiter. Today, the Downey facility is closed with sections being preserved as a national historical site. Its history and personnel have been moved to the Boeing Huntington Beach Division to work on the Delta IV, the X-37, Space Shuttle mods and updates. Among them, not surprisingly, are the children of the people that worked on the NAVAHO.



W. FRED GIBSON and his son JAMES N. GIBSON, attend the NMA sponsored "HERITAGE NIGHT" at the Downey Facility, March 18, 1999.
FRED retired in 1986 after a 35-year career at NAA-Rockwell, his son, JIM, is a recognized historian of the "NAVAHO" Program.

Dear Ed,

On February 11, 1948, I walked into the Douglas Aircraft employment office at Lakewood Blvd and Carson in Long Beach, CA. I saw two desks with a man behind each. I got into a line and was handed an application to fill out. Later, I returned it to one of the men behind a desk.

He read the application and told me, "We can use you! When do you want to go to work?" I answered, "Right now, if I can." He responded, "You are now employed by North America Aviation."

I told the man, "I thought this was a Douglas plant." He said, "That man over there is Douglas if you want to see him" I answered, "I'll work for you!" That was the best decision I've made in my lifetime.

1 worked in Production until October 1959, then transferred to Tooling for the remainder of my 40 1/2 years of service. What a beautiful company to work for. I retired on September 30, 1988.

Respectfully, Loren "Ole" Johnson, Long Beach, CA

☆☆☆

Dear Ed,

I enjoyed the article regarding your recent visit to KSC since it has been many years since I had been to Cape Canaveral. You mentioned your memories of the Propulsion Group in Downey. I was part of that group but my unit, Tooling Development, was located several miles from the Downey plant in the "middle of nowhere". We also had German V-2 rocket parts for the purpose of building the tooling needed to manufacture the parts.

However, the biggest challenge was going from the "solid wall" to the tubular rocket engine. Our final development of the dies and presses to form these tubes led to the fantastic success that Rocketdyne experienced in rocket engines. I was one of several that practically lived on the job during this period.

Another major problem was to properly drill the impingement holes in the injector rings. We were having an 80% rejection rate due to unequally spaced holes. I resolved that issue with an automatically indexed rotary table which I devised.

I am now 85 years old and its 24 years since I retired from Rocketdyne but I still have dreams of trying to resolve some damn tooling problem. What a waste of sleep!

Sincerely, M. F. "Sal" Johns, Sun City West, AZ

☆☆☆

Dear Ed,

My wife and I got married on February 5,1955 just before we drove from Chicago to Los Angeles on our honeymoon. At the time, I was working as an engineer for IBM in Chicago.

During the honeymoon my cousin, Dean Klivans, got me an interview with Harrison Storms and he hired me on the spot because the Tri-Sonic Wind Tunnel was not quite finished and was getting an ALWAC computer and a slew of IBM equipment.

The digital data system was being designed and built by Autonetics in Downey so I spent a lot of time out there preparing the system for delivery. When it arrived at El Segundo, our boss at LAD had to inspect it.

When we opened the power cabinet, he found a large dummy of a naked lady with red paint on all the unmentionable places! This brought our boss, W. Daniels Jr., to a boiling point. I had nothing to do with it but the Autonetics crew was a very mischievous lot and I always suspected them of the deed!

Cordially, Charles I. Klivans, Redondo Beach, CA

☆☆☆

Dear Ed,

Please thank Rolf Schmued for his excellent article on his father Ed Schmued. As an NAA Tech Rep in combat, I was in close touch with Ed and admired him. He was the best of the best. I had the privilege of being in charge of the assembly of 500 A-36's (Editor's Note: The A-36 was the original version of the P-51) in the African theater of war. I also test flew the first Mustang in Africa. I kept in touch with Ed in Oceanside, CA until he died. We all can be very proud of him!

Sincerely, Al Lofquist, Las Vegas, NV

☆☆☆

CONTRAILS FROM THE PAST is a new column to highlight some of the events of the past that form the rich heritage that was North American Aviation, Inc. We have lost our name but our glorious memories remain. If you have a "memory" that you think will serve this column, please send it to us with the heading ATTN: Ed Rusinek. Depending on space and aptness, we will try to include it in forthcoming issues.

Ed (at right) gives it a try in the simulator

During a recent special tour of the NASA Dryden Flight Research Center at Edwards Air Force Base, staffer Ed Rusinek was invited to fly the in F/A-18 Hornet flight simulator. After a very detailed 45-second briefing, he took over the controls. Takeoff and the flight were good and the landing would have been acceptable except it was 100 feet lower than the runway at Edwards.
This year Edwards AFB will celebrate 50 years of experimental flight. Edwards AFB was formerly called Muroc Air Base and was under the control of the Army Air Corps



NORTH AMERICAN AVIATION INC. ENGINEERING DEPT. —

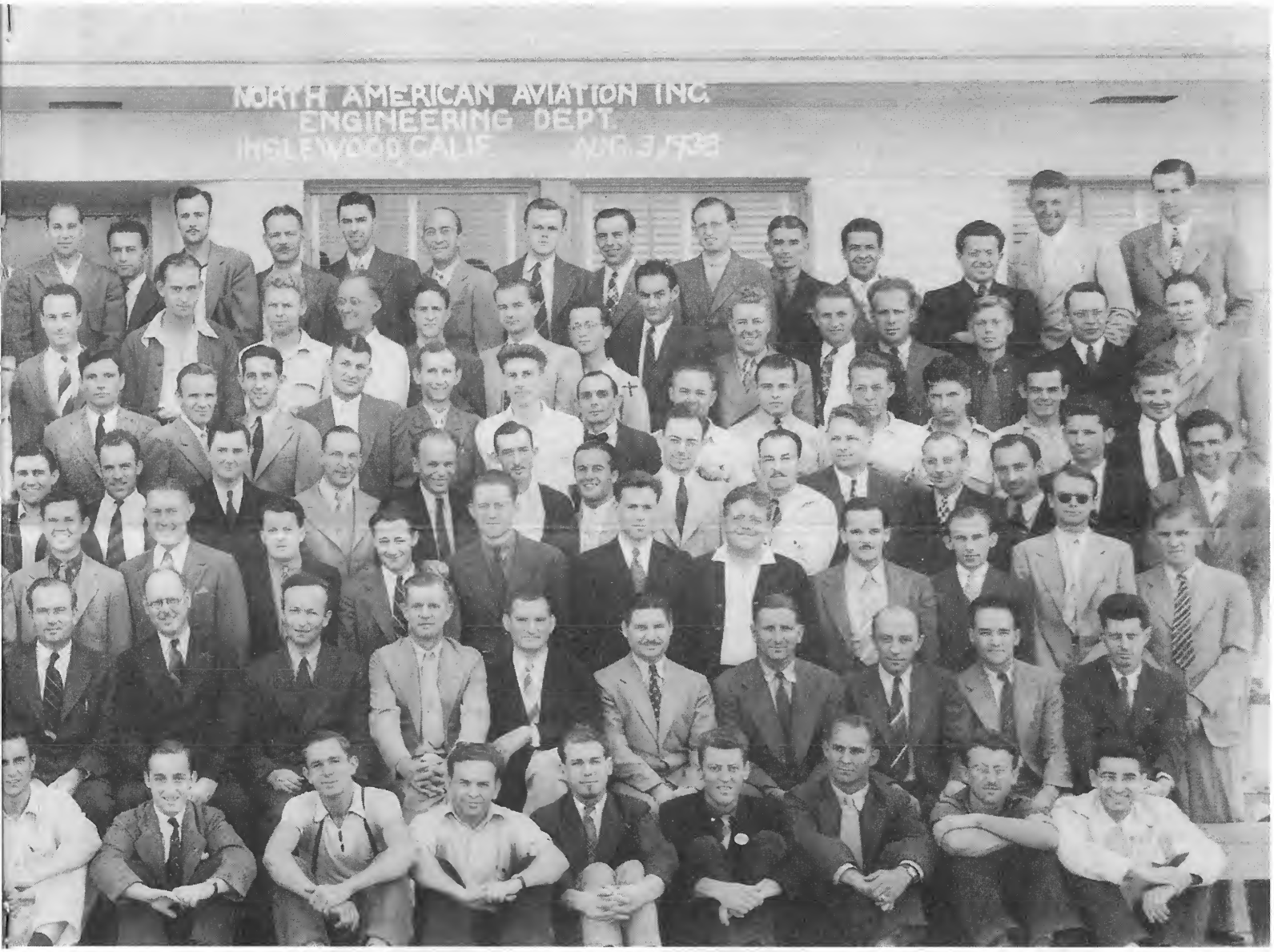


Row 1. (Top) Larman Jirsa, John Brueckner, Larry Ernst, Andy Schmidt, Carl Torresen, Art Ford, Roy Raynor, Paul Wierk, David McCalla, Jim Broadston, Cecil Davis, Ray Kochevar, Dick Pribil, Walt Spivak, Les Hall, Norm Surtees, Howard Field, Johnny Kimball, Bill Beardslee, Duan Olmore, Bob Morgan, Guy Huffaker, Marvin Burtnett, Frank Walton, Harry Zuckerberg, Ed Horkey, Paul Anderson.

Row 2. Al Strong, Bill Harris, Lee Norwood, G. B. Moores, Francis Butler, Stan Hellman, Frank Siminger, Bob Dodds, Chandler King, Ed Spring, Jack Burnett, Thurmond Bibb, Warren Knieriem, Eugene Moskow, Frank Seltzer, Joe Dobler, Al Rosenberger, Henry Raeber, StanHall, John Bennett, Don Leitch, Pres Spalding, Howard Westling, L. A. Kent Fred Boeke, Sub Makela, J. F. Davenport, Howard Evans.

Row 3. Bud Childs, Ray Clark, H. A. Ericksen, Gus Ruppert, Joe Beer, Dane Roe, Indra Lusk, Harold Zimmer, A. C. Thore, Tom Bonde, George Bentley, Jack Hill, Bill Barker, Bill Edmonds, Herman Fleck, George Gehrkens, Ralph Maxwell, J. L. Brock, Paul Jones, Art Hausemann, Paul Haworth, Kent Thompson, Vein Wager, Dan Halloway, Clyde Maulding, Fred Prill.

DUTCH KINDELBERGER'S DREAM TEAM — AUGUST 3, 1938



Row 4. Bill Morgan, Herb Snow, Bob Hartle, Edward C. Robinson, Harry J. Carney, Arthur Di Staci, Bill Carr, Bob Baker, Fred Morgan, Charles Kinzek, Dick Smith, Roland Hall, Floyd Wright, Fred Smith. Al Trich. Karl Koenig, L. J. Fuller, Lowell Perkins, Dave Hoffman, Thurman Wood, Al Algier, Cy Holton, Earl Butler, Peter Tassop, Eugene W. Browne, Loring K. Margiot.

Row 5. Bob Rios, Chet Coleman.Gus Edwards, Bob Walker, Louie Berthelson, Bert Binge, Carl Wolf, Si Reppert, Dick Bumb, Bob Sheldon, Johnny Young, Herb Baldwin, Red Hansen, Dave Mason, Henry Trich, ? Anderson, Stan Zemansky, Lee Glaze, Earl Defibaugh, Milt Schoenfeldt, G. Sturgess, Johnny Maxian.

Row 6. Eric Martin, Eunice Le Melle, Doris Bellman, Pat Andrews, Dorothy Lewis, Racquelle Rios, Roberta Clark, Helen Head, Francis Shumaker, Mike Fleck, Mary Hannum, Newt Houston, Ray Rice, Noble Shropshire, Lee Atwood, Harold Raynor, Ed Schmued, Dick Schleicher, Alex Burton, Frank Sigafoose, Joe Myser, Gordon Throne.

Row 7. Ray Lamb, Terry Allen, Bob Greenwald, Frank Allen, Win. R. Otey, Ivar Peterson, Art Bevers, Marc Malsby, Buzz Holland, John Jonas, Bob Mease, Clay Chapen, Bill Rommel, Dick Alexander, Tom Tremayne, Dan Izzo.

Amland, Ronald D.
Andersen, Keith V.
Andres, John R.
Arvin, George
Baker, Lloyd E.
Barauskas, Stanley M.
Barry, Pauline I.
Beckner, Boyd H.
Beigle, C. Jack
Binder, Thomas M.
Birdsall, William
Birdsill, Arnie
Birgen, Dominic F.
Bishop, C. Ron
Blair, Thomas A.
Boone, John R.
Borger, Geraldine A.
Borger, John M.
Bosdet, Rhoda L.
Boyles, Hal
Bright, C. W.
Brown, Gerald G.
Cagle, Reta
Carlson, Stephen W.
Casey, John W.
Cherney, Joseph
Cicchese, Joseph L.
Clune, James G.
Cole, Gary & Barbara
Conrad, William N.
Cooper, Wil.
Cramer, Daniel W.
Cramer, T. D.
Cravets, Thomas
Crockett, Robert
Culleton, Richard
Daugherty, William F.
Davison, Charles T.
Dean, William E.
Diekmann, Wendell R
Driskell, James
Eaglen, Ralph E.
Eichinger, David C.
Ellis, Thomas H.
Engle, Bernice C.
Ernst, Richard
Fierstos, William A.
Finks, Sid R.
Finlay, Al W.
Finneran, Ted J.
Fong, Frank
Fore, Wallace
Frazier, C.O.
Frushon, Robert A.
Gallanes, Harry
Galovich, Peter
Garcia, J. A.
Godward, James R.
Gondo, Tom T.
Goodman, Verlin E.
Goodwin, Robert E
Gore, Donald
Gore, Hal
Goss, Joseph R.
Green, Michael J.
Haas, Larry
Hall, Lester G.
Halpin, William
Hand, William "Bill"
Hanes, Herbert E.
Hansen, Richard
Hardy, Glenn
Harris, Vahl E. Jr.
Hartberger, Helen R.
Hello, Bastian "Buzz"
Herst, Rosa Lee
Hesseldenz, John S.
Hetzel, Gary P.
Hoffman, Victor Q.
Holt, Roger M
Hough, Merle E.
Housego, Wilma D.
Hovda, Robert E.
Howard, Ernest
Hughes, A. James
Husa, Alfred
Isaacs, Robert W.
Johnson, Loren E.
Jones, Kenneth G.
Jones, Robert M.
Jones, Roy E. Jr.
Juelich, Otto C.
Just, Virgil L.
Kabey, Joe
Kelch, Charles
Kelley, Gary N.
Kelly, Glenda
Kemper, Edward H.
Kenyon, Howard H.
Kindelberger, George
Koblosh, John
Koeppe, Robert W.
Kurtz, Geraldine
Lacayo, Henry L.
Lamkins, Albert U.
Langfeldt, Paul
Leatherby, Sandy
Leatherman, Nolan
Leccese, Vincent H.
Lee, Sang
Lekawa, Edward R.
Levine, David
Levy, William
Lindley, Joy
Lore, Victor R.
Margolin, Sanford
Margolis, Morton
Marshall, David
Marta, George
Martin, Jim
Martin, Norman E.
Martin, Thelma
May, Ralph E.
McCarty, Harlan A.
McCleary, Ralph W.
McCormick, G. Paul
McDermott, Thomas
McLain, Joseph P.
McRae, James
Menezes, M. F.
Meyers, Kenneth K.
Mezzacappa, Michael A.
Miles, Eugene
Miller, Rodman
Miller, William R.
Montavon, Vernon L.
Moon, Arthur J.
Moore C. A.
Moore, Joseph
Moore, Robert L.
Morgan, Ed
Morley, Richard
Mulgrew, David B.
Myers, Dale D.
Nease, Robert F.
Nissen, Hal
Nunnally, Jackson
O'Brien, Terrance"T. J."
Okuda, Jack H.
Olsen, Milo R.
Page, George H.
Papp, Arthur
Pappas, George
Paris, Ernest E.
Parker, Norman
Parlier, Shirley
Parsons, Thomas
Petersen, Robert C.
Peterson, Paul F.
Pierce, Kenneth L.
Pierce, James M.
Pleasant, Solomon H. Jr.
Quon, Don
Raiklen, Harold
Redfearn, David R
Robertson, Ronald D.
Robinson, Woody W.
Romo, Oscar A.
Roncevich, Daisy
Ruud, Ralph H.
Sammons, Gerald
Sanderman, William F.
Schell, B.J.& Ken
Schmidt, Jimmy L.
Schmidt, Lloyd C.
Sexton, Robert
Shaw, Alvin W.
Shuler, Thomas K.
Snelgrove,Tod
Stacey, R. A. "Dick"
Stakelbeck, Larry F.
Stinson, Dale & Peggy
Swann, David C.
Szupello, Dorothy M.
Thompson, Donald B.
Thresh, James L.
Turner, Stephen
Van Quekelberg, Arthur
Vance, Armetta C.
Vern, Fred
Vernon, Otis C.
Voiles, Fred
White, Stanley A.
Whitesell, Charles B.
Wilson, Melvin L.
Wiltsie, W. Lee
Wong, Wally W.
Yarbrough, Norma L.
Young, James
Zemansky, Stanley

HONORARY LIFE MEMBERS

Axtell, Howard "Bill"
Flavin, John
Fowler, Ken E.
Haun, Maxine
Jones, Walt C.
Juif, Michel A.
Markel, John
Mendez, Jesse
Tabor, Rex
Tindley Andy D.

SILVER EAGLES are Life Members that have contributed $100 or more
HONORARY LIFE MEMBERS are staff members with 5 or more year of voluntary services with the Retiree News

***Honorable Mention ***
Special thanks from the Bulletin Staff and the Bald Eagles to:
WILLIAM HALPIN
for his very generous contribution

North American Flying Horsemen

Joan and Harold Shapiro hosted the 16th annual reunion of the North American Flying Horsemen, Friday, Saturday and Sunday October 20, 21 and 22, 2000 in Yorba Linda, California.

Those attending the reunion from out of town stayed at the Best Western Anaheim Hills Motel, which included a continental breakfast, and HBO. On Friday evening the club enjoyed a dinner buffet. On Saturday morning, again hosted by the troop, breakfast was held in the banquet room of Keno's Restaurant located next door to the motel. After breakfast, the club was invited to tour the Richard Nixon Library, who most did while the Directors held their annual meeting. The Club is going to investigate establishing a web site enabling all of our photographs and all of our important documents accumulated since 1937 to be made available to those interested through the Internet. It would also eliminate the logistics of transporting our many scrapbooks from reunion to reunion. It was also recommended for us to find a central location to have our annual reunions alleviating the effort required in hosting these events. Rowdy-O reunion XVII will be held Monday, Tuesday and Wednesday, September 10,11 and 12, 2001 at Konocti Harbor Resort + Spa, located at 8727 Soda Bay Road, Kelseyville, CA 95451 (800) 660-5253. The facility is located near Clear Lake, 2 ½ hours North of San Francisco and 1 ¾ hours from Sacramento. For reservations contact Linda Morse at (800) 234-5066.

On Saturday evening after all of the meetings, the club enjoyed their traditional shrimp feed with all of the trimmings. This year we were treated to a high-tech cake created professionally with the use of a computer, prepared by Jill Phillips, daughter of troop member Doris Burtle. The face of this cake had an exact duplication of a photograph of the troop at a past horse show. Also included on the face of the cake in handwriting were the names of all those who attended the reunion. All parts of the cake were eatable. Chocolate chip may soon have another meaning. On Sunday, after breakfast, the members were treated to a day at the races at Santa Anita. Here we were given free parking, free programs, free clubhouse passes and free box seats. Those who attended the races enjoyed the day immensely. Realize the troop is made up of experienced horsemen that have a keen eye in horse conformation, being able to detect athletic ability and good health. However, I over heard some of these experienced horsemen making their wages predicated on the horses or jockeys name rather then what the horse looked liked. We were all big winners, not in money but in a weekend filled with enjoyment and companionship.

We had 35 people attending the Rowdy-O VI. Not everybody attending the reunion is in the enclosed picture below.

Signed: Harold Shapiro
Secretary, North American Flying Horsemen



Standing from left to right, Diane & Marlin Albert, Doris Burtle, Audrey Corkery, Grace Ferren, Marilyn Mociun, Linda Morse, Jim Walsh, Ray Jegge, Harold Shapiro, Charlie Wolfe, Pat Jegge, Joan Shapiro, Dave & Siri Whitesel

Kneeling, from left to right, Ted Mociun, Tim Corkery, Bob Morse.

Attendees not in the picture are: George Bigenho, Paul Brewer, Jim Canning, Jim & Virginia Coffey, Fred & La Vonne McQuilkin and Stan Mellin.

Special Guests were: Laura Chedister, Mary Graes, Cindy & Tim Koprowski, John, Karen & Kelly Welch and Dorothy White



MATTESON, GEORGE M., 86 slipped away quietly, alone on his farm in DeKalb, TX, on October 27, 2000. He received flight training with the U.S. Navy at Pensacola, Fl as an aviation cadet. Released from the navy to join the Royal Canadian Air Force. Served in the RCAF until America entered WWII. He was released from the military due to an arm injury and became a civilian test pilot for Curtis-Wright, checking out P-40's He moved to NAA when production of the P-51's started. In addition to the Mustang series, he tested almost all of the NAA aircraft that followed. He was the command pilot on the modified B-52 that carried Scott Crossfield on his historic missions in the X-15. He retired, circa 1975 as the Chief Pilot of Production Flight Test. He was laid to rest in family plot in Dollarhide Cemetery in Foreman, AR. His very good friends, Bill Yoakley and Arthur "Spider" O'Connor notified us.

ABRAMS, MALCOM, 75 — of Yorba Linda, CA, passed away. No other information available. Obtained from an obit sent in by Maxine Haun.
AGUILAR, BENNLE, 73 — of Stanton, CA, an electrical engineer/technician for Boeing, died January 23, 2001, of diabetes. Sent in by Maxine Haun.
ALDAPE, JOHN M. — passed away December 20, 2000. He was a 76-year resident of the Harbor area and was an engineer for Rockwell International for 30 years. Obtained from an obituary from a local paper.
ANDERSON, VERN E., "ANDY", 89 — of Anaheim, CA, passed away on December 17, 1999, in Phoenix, AZ, where he had been staying with his daughter and son-in-law after his wife's death in early 1999. He retired from North American Rockwell after many years in Quality Control. Barbara Poore, Phoenix, AZ, notified us.
ANDREASEN, CARL H., 78 — passed away on March 22, 2001 in Garden Grove, CA. In 1962 he worked for Rockwell as a Pricing Specialist until his retirement. Information taken from an newspaper obituary sent-in by Maxine Haun
AYERS, HENRY C., 70 — of Cypress, CA, passed away of cancer on August 24, 2000. He was a design engineer for Rockwell International.
BALCAM, DENISE, 75 — passed away February 22, 2000 of heart disease at Corona Regional Medical Center. She worked for 30 years at Rockwell International in Anaheim. Obtained from an obit in Hemet News.
BANKS, ED , 90 — died on March 13, 2001. He worked at the LA Division and on the Apollo Program. Reported by his niece
BANKWITZ, ROBERT, 67 -- passed away in Laguna Hills, CA, on July 3, 2000, after a battle with cancer. He retired from Autonetics. His daughter, Susan, notified us.
BARNETT, DR BUFORD F., 69 — of Anaheim, passed away February 3, 2001. Dr. Barnett retired from Rockwell International where he was a Senior Research Chemist. Information from an obituary in a local paper sent in by Maxine Haun.
BARTO, R. — of Rancho Palos Verdes CA, has passed away August 30, 1999. Retiree News returned marked "deceased".
BLAYDEN, LEONARD ROBERT, 87 — passed away due to heart failure January 18. 2001. Bob started work for North American Aviation as a line mechanic and retired from Rockwell International as a supervisor in Quality Assurance. He worked from 1940 to 1976 on many programs; LAD - P-51 & B-25 preparation for Doolittle's mission; Edwards AEB and Cape Kennedy on the X10; Downey, G-26, Hound Dog, X-15 & Apollo. His son, Rob Blayden, a retiree of BNA, notified us.
BREESE, DAVE — an airborne test engineer on Vigilante and Bronco Programs at Columbus, has passed away. His good friend, Dick Morley, reported his passing.
BREDHOLD, B. A. — of Tulsa, OK has passed away. Retiree News returned marked "deceased".
BRELER, HAROLD EDWARD, 82 — of Westminster, CA, died October 15, 2000 of natural causes. He was a retired industrial engineer from Rockwell International who hired into Kansas City about 1942. Claude L. Lewis, Orange CA and Al Alirens notified us
BRENT, FORREST — of Manhattan Beach, passed away in January 2000. Lory Watts notified us. Retiree News returned marked "deceased".
BROWN, ROBERT (BOB) — passed away at Scripps Memorial Hospital in Carlsbad, on January 30, 2001. Bob worked in Shipping and Facilities and was an officer in the Management Club. His friend, Larry Livers, notified us.
BSTANDIG, LEO J., 76 — of Torrance, CA, passed away December 26, 2000. Leo had been employed by Rockwell International for many years and enjoyed all types of dancing, including ballroom, country western and polka. Information is from a Daily Breeze obituary.
BYRD, EUGENE (GENE) — passed away on June 6. 2000, in Escondido, CA. Gene started as an instrumentation engineer in the Flight Test Department. He retired in 1982 from Flight Test as Manager of Special Projects. His good friend, Arch Forman, notified us.
CAMPBELL, ALBERT T., 78 — passed away December 17, 2000, in Bend, OR of heart and kidney failure. He worked at Edwards Air Force Base and Plant 42 in Palmdale in Quality Control and Calibration Lab. His wife, Peggy, notified us.
CAMPBELL, GORDON W. — passed away on January 9, 2001, in Fresno, CA, due to respiratory complications. He hired into Engineering Thermodynamics Group at LAD in 1945, was Thermodynamics Group Leader for the last 20 years and retired in 1978. Dan Winter of Torrance, CA notified us.
CARPER, GRACE L. — of Red Bluff, CA. Retiree News returned, marked "deceased".
CAULKINS, HAROLD, 76 — died suddenly at home in La Mirada, CA, on January 6, 2001. Harold worked primarily in Business Management on the Apollo and Shuttle Programs. His good friend, Ed Peterson, notified us.
CAZARES, EDWARD — has passed away. Celine Cazares reported his death.
CHASE, TONY — from D/098 Contracts & Pricing passed away recently. Marilou Derocher notified us.
CHISM, W. H. — of Rancho Palos Verdes, CA-- Retiree News returned, marked "deceased"
CHURCHILL, LLOYD — of San Jose, CA, died June 5, 2000. He retired from the Space Division in Downey in February 1974. His wife, Loretta, notified us.
CLEMENS, JAMES D. "JIM", 80 — of Winchester Bay, OR, passed in September. 1999, at his daughter's home in Los Alamos, NM, of Alzheimer's disease. Jim worked for NAA/Rockwell from 1937 to 1973. He was an engineering group leader for all NAA-designed aircraft, Engineering Manager of Saturn Ground Support & Test Equipment and Director of Commercial & Transportation Programs. He was Engineering Consultant on the HIMAT program and many other firms apart from NAA/Rockwell.
COAKLEY, GEORGE — passed away June 17. 2000, of a trauma to the head. George had 40 years with the company, retiring from Tulsa, OK. His wife, Thelma, who retired with 30 years seniority, notified us.
COLMER, JOHN MICKEY, 83 — a four-sport star at Redondo High who went on to play pro football, basketball and baseball in the 1930s-40s passed away July 20, 2000. Later, he worked as project coordinator for the Shuttle Program at Rockwell International. Mickey retired from the Space Division in Downey in the late 90's. A good friend, Don Berry, and an article in the Daily Breeze provided the information

CROSS, LEONARD S. — passed away on August 24, 1999 caused by cerebral hemorrhage and respiratory failure. He was department head of Purchase & Labor, D565 and retired in 1970. His loving wife, Evelyne notified us.
DAVIS, J. N. -- passed away in Weston, W. Virginia, in December 2000. He was a stock-chaser at LAD. C. V. Davis, Camarillo, CA, notified us.
DIEHL, GERALDINE CHARLOTTE, 83 — of Huntington Beach, CA, a retired Rockwell employee, died January 10, 2001, of hypertension. Information from an obituary in an Orange County paper.
DOWDY, JAMES TOM, 85 — passed away August 3,2000 at Lancaster Community Hospital, Lancaster, CA. He had suffered another heart attack, complicated by his diabetes and kidney problems. He retired as Manager of Quality Control in 1978, after 35 years of service. His wife, Barbara, is residing at the Antelope Valley Rehab Center. Lancaster. CA. She broke her hip May 25th and is suffering from severe Alzheimer disease. His son, Louis "Tom" Thompson, Woodland Hills, CA and Hank Triche notified us.
DUNBAR, KATHLEEN — passed away last May of Alzheimer's disease. We were notified by her husband, Jim Dunbar, La Mirada, CA.
EARHART, E. G. — of Palmdale, CA has passed away. Retiree News was returned marked, "deceased".
EDWARDS, JOHN HENDRICK, 79 — of Santa Ana, CA, a retired worker for Boeing, died January 3, 2001.
EICH, JOHN P., 84 — of Orange, CA, a retired engineer for Rockwell International, died February 2, 2001, of chronic obstructive pulmonary disease. Information from an obituary sent in by Maxine Haun.
EINSTEIN, LLOYD THEODORE, 73 — of Placentia, CA, died December 16, 2000 of cancer. He was a research physicist for the Autonetics Marine Systems Division of Rockwell International.
ELLIOTT, CHARLES "RED", 84 — passed away December 29, 2000, in Hawthorne, CA. Red was a WWII veteran, serving in the Asiatic Pacific Theater and retired from Rockwell in 1976 as an inspector, after 31 years of service. Information from Daily Breeze obituary.
FALK, RUTH L., 61 — passed away March 28, 2000, of cancer. She retired from Rockwell as an administrative secretary. Maxine Haun notified us.
FERREN, ROY WILLIAM — passed away January 5, 2000 from cancer. Roy joined NAA shortly after the company moved from Maryland and was a member of the Engineering Flight Test organization until retirement. Information from Neal Scott, Engineering Flight Test, LAD.
FINK, RUTH, 63 — passed away from breast cancer on June 2, 2000. She retired from Autonetics in 1991 and moved to Las Vegas. She later moved to Missouri around December 1998, to be near her family.
FISHER, DAN — died on December 12, 2000, in a nursing home in Westby, Wisconsin, as a result of Parkinson's disease. His friend, George Page, informed us.
FOOTE, HOWARD (BUD), 75 — passed away, on December 20, 2000, after a long battle with Alzheimer's disease. His wife, Shirley, notified us.
FREDENDALL, VIOLA, 87 — passed away in February 2001 in Hemet, CA. She worked for 10 years in Planning at North Amrican Rockwell. Eugene S. Somers of Idylwild notified us.
FRENCH, DR. BARRY T., 66 — of Placentia, CA, a physicist for Rockwell International, died January 17, 2001, of heart disease. Obit information was taken from a local paper.
FRENCH, EUSTACE A. — died quietly in his home June 2, 2000. He was an avid pilot, built model airplanes and competed in various free flight events and even held a world speed record in U-control. He worked as an aeronautical and space engineer for North American Aviation contributing to many programs including the X-15, the Apollo and Space Shuttle He retired from the aerospace industry in 1979. His wife, Nancy of Canyonville, OR sent information to us..
GANN, HARRY SEABORN — passed away on October 30, 2000, after a protracted fight with cancer. He was a mechanical engineer working for North American. Aviation, Douglas Aircraft and two small aircraft companies. Obit information was taken from a local newspaper.
GARCIA, PHILLIP — passed away on November *25,* 2000, of a heart attack. He was a heavy forklift operator in D/79. Nash St. docks. Reported by his brother, Virgilio.
GEROW, WILLIAM H. — passed away on January 2, 2001. He worked at North American/Rockwell for 37 years. His son notified us.
GRACE, JACK K. -- passed away February 23, 1998, from a heart problem. Jack joined NAA as a chemist in 1940 and spent several years at the Dallas Division in Material & Processing and retired in 1979. Neal Scott, Engineering Flight Test LAD, gave us the information.
GYLFE, L D. (DON) — an engineer, died in September 2000, in Calabasas, CA. A relative, C. V. Davis, Camarillo, CA, notified us.
HAAKE, AGNES CECILIA, 70 — of Anaheim, CA, a senior financial planner for Rockwell, died January 29, 2001, of cancer. Information from an obituary sent in by Maxine Haun.
HAMILTON, CHARLES "RED" — passed away in the first part of May 2000. Gene Hales of Stuart, OK notified us.
HANSTAD, TERRY, 70 — passed away January 2, 2000 in Banning, CA from heart disease. He was a Cost Analyst with Rockwell International for 35 years, retiring in 1987 and continuing working as a consultant. An obit in the Press-Enterprise provided the information.
HARRELL, JAMES, 90 (incorrectly reported as James M. Hill in Fall 2000 issue) passed away in Running Springs, CA on January 23, 2000, from a heart attack. He started at North American Aviation in 1939 and retired in 1975 from Space Division. Lorraine Harrell notified us.
HEIMER, FRED, 81 — passed away January 15, 2001. He was living in Athens, West Virginia, at the time of death. Fred worked in Quality Control at LAD and Palmdale and retired around 1980. Bob Bergeron of D/214 Tooling, LAD, from Redondo Beach, notified us.
HERNANDEZ, CARLOS — NAA retiree, died of a massive stroke on November 11, 2000. His good friend, Joe Lovenduski, notified us.
LIMURA, MASAO, "MAS", 71 — passed away February 15, 2001 at home in Yorba Linda, CA, with his family, after a short but courageous battle with liver cancer. Mas accepted a position as a programmer with North American Aviation in Columbus, Ohio. He transferred to Anaheim, CA in 1969 and retired after 30 years of service but did computer-consulting work for another seven years. Information from an obituary from an Orange County paper sent in by Maxine Haun.
KALAFSKY, A. J. — of Paradise, CA. Retiree News returned, marked, "deceased".
KEELER, FOREST SPENCER, 70 — of Orange, CA, a systems engineer for Rockwell International, died on February 12, 2001, of cancer.
KILGORE, ROBERT EARL — passed away on January 19, 2000 in Woodland Hills, CA. Bob worked in Logistics and Reliability at Rocketdyne. An obituary in the Daily News, referenced by Joe Byrne, gave us the information.
KOSTIN, LEN — passed away January 6, 2001, of prostate cancer. He began working for Rockwell International in 1956 and retired in 1994. He worked in Engineering in aerodynamics, thermodynamics, propulsion and wind tunnel areas.
KRELL, HAROLD, 76 — died December 27, 2000, in Hemet, CA. He was a technician for 33 years at Autonetics. Information from Gene Logelin and an obituary sent in by Gene Somers.
KUCHS, WILLIAM B. — died on January 11, 2000, at West Hills Hospital. He retired after 37 years with NAA/Rockwell in Engineering at LAD, Fresno and Atomic International. An obituary in the Daily News, referenced by Joe Byrne, gave us the information.
KUDENOV, ALEXANDER — passed away at the age of 80, on November 8, 2000. His wife, Mary, notified us.
LAWHEAD, JAMES, "JERRY" — passed away on December 28, 2000, in Lancaster, CA. A good friend, C. W. "Bill Bright, notified us
LAWSON, RUPERT, 93 — died December 12, 1999 in Hemet from heart disease. He was a lead man for 20 years for North American Rockwell, LAD. A Hemet News obituary gave us the information.
LITE, J. — of Anaheim, CA. Retiree News returned, marked "deceased"
LONG, RICHARD — died January 31, 2000, of a heart attack at his Hemet home. He was a senior purchasing agent at Rockwell International, where he worked for 29 years. Obtained from an obit sent in by Gene Somers, Idyllwild, CA
LOWRY, SIDNEY JAMES, 79 — passed away March 15, 2000, in Little Company of Mary Hospital in Torrance, CA, from myocardial infarction. Catherine Lowry notified us.
LUDIN, RAY D. O. — died February 14, 2001. He worked for 30 years in the aerospace industry and made contributions to programs such as Minuteman Missile, Apollo and Space Shuttle. Obtained from the obit of a local paper.

MATLACK, DAVID WALCOTT, 79 — passed away July 25, 2000, in Mar Vista, CA. He worked as a mathematician in the Master Dimensions Group until 1986. Information from an obituary from a local paper sent in by Maxine Haun.

MAY, THOMAS E., 74 — of Fullerton, CA, an electrical engineer for Rockwell International, died July 31, 2000. Information from an Orange County obituary sent in by Maxine Haun.

McCARLEY, ARTHUR, 83 — died January 11, 2001 at Sunset Nursing Home in Purcell, CO, after a long battle with Alzheimer's disease.. He worked as an aerospace technician for nearly 40 years for Douglas Aircraft and Boeing North American, from which he retired in 1981 as an aerospace technician. He worked in several different locations including California, New Mexico and at Cape Kennedy, Fla., where he worked on the Apollo Space Program. Chuck McKim of Clifton, CO, who retired 1975, sent us the information.

MERCHANT, PHILIP HAROLD, 72 — of Huntington Beach, CA, a retired electrical engineer for Rockwell, died November 30, 2000. of a stroke. Information from an obituary in a local newspaper sent in by Maxine Haun.

MEELY, LADY — of Lomita, died January 9, 2001. She retired after 30 years at LAD, Plastics Department. Information from a Daily Breeze obituary.

MEGRUND, HENRY — passed away suddenly on December 10. 1999. He retired in 1988. His wife, Eunice, notified us.

MILETICH, WALTER T. — passed away February 15, 2001 due to a stroke. He retired from Rocketdyne, D/519 after 25 years in the Experimental Manufacturing Engineering & Planning Dept. His wife, Katie Miletich of Grants Pass who retired from Rocketdyne in 1981 as staff assistant to Ralph Eaglen, VP after 25 years of secretarial positions, notified us.

MORREALE, GASPAR, 84 — of San Clemente, CA, died January 23, 2001, of natural causes. Information from an obituary mailed in.

MUSHIN, RONALD S. 67 — passed away December 26, 2000, in his sleep, after battling diabetes for many years. He worked for the Missile Division and then the Space Division of North American. Ron, an electronics and instrumentation engineer worked for NAA for 30 years and retired in 1988. We were notified by Ed Cohn, Fullerton, CA.

OLSSON, JOHN FREDERICK, 77, — of Fullerton, a Contracts Administrator for Boeing, died February 13, 2001 of congestive heart failure. An obituary notice from Maxine Haun notified us.

PARKER, GRACE Z., 76, — of Chino Hills, formerly of Anaheim, died January 8, 2001, of cancer. Grace was a shop clerk/secretary at Autonetics Anaheim for many years.

PETERSON, ANNEVA PAULINE HENDRICKSON, 73 — passed away suddenly on January 5, 2001, from pneumonia. Information taken from a local newspaper.

PETTY, JOHN, 75 — died of heart disease on May 31, 2000, in Murietta, CA. He was a mechanical engineer for Rockwell for 37 years. Information from an obituary sent in by Gene Somers, Idyllwild, CA.

PHILLIPS, DEAN, 84 — passed away January 11, 2001, at his home in Rockville MD. He was a former labor and public relations executive in Columbus and the president and chief executive from 1973 to 1980 of what is now Goodwill Industries International, a nonprofit provider of employment and training services for people with disabilities and other needs. He retired in 1973 after 35 years of service starting in Los Angeles, then Kansas City and finally Columbus, OH. Carole W. Phillips, Rockville MD, notified us.

PONDROM, WALTER L. Jr., Dr. 84 — died on March 24, 2001 at his home in Austin, TX Walter received BA, MA and Ph.D degrees in Physics from the University of texas in Austin. He moved to Whittier and worked for North American Aviation in 1951. In 1962 he was lead theorician in laser gyro development. He held management positions in general physics systems and instrument groups. In 1983, Walter was named "Engineer of the Year", Rockwell's highest honor. Information obtained from an obit sent by Maxine Haun.

PORTER, MIKE — passed away in Carson City, Nevada, in May of 2000. Mike was a Space Division Customer Relations Representative for the Apollo Program. Andy Tindley notified us.

PRIEST, J. — of Salem, OR. Retiree Bulletin returned, marked" deceased".

PROCOPIO, VINCENT, 62 — passed away March 3, 2000, due to a heart attack. He worked in Shuttle System Engineering. Jack Parker notified us.

RAMSDELL, RALPH G., 80 — of Anaheim, CA, a retired manager for Rockwell International, at Columbus and Autonetics, died January 4, 2001, of congestive heart failure. He worked for the company for 34 years and was a manager in Columbus. Information from Terry Nieuwlandt and a news clipping submitted by Claude Lewis..

RAY, CECIL L, 91 — died November 18, 1999, from aging complications. He was a technician for Rockwell North American in Downey for 10 years before he retired. An obit in the Press-Enterprise provided the information.

REDMERSKI, H. J. — of Torrance, CA. Retiree News returned, marked "deceased".

ROBB, RONALD BRUCE, 67 — died October 23, 2000, of a heart attack. He was an engineer for North American Rockwell. Obtained from an obituary in a local paper.

ROBERTS, RICHARD D., 83 — of Los Alamitos, CA, died January 19, 2001, of natural causes. He was an aircraft designer for North American Rockwell.

ROGERSON, DON — died in December 1998 from multiple strokes. Robert H. Johnson, Manhattan Beach, CA Beach, notified us.

RUTAN, DONALD RAY — passed away January 23, 2001 due to complications of diabetes. He went to North American Aviation in 1962 and retired from Autonetics in 1989. Information from an obituary sent in by Maxine Haun..

SAHNER, M. — of Long Beach, CA. Retiree News returned marked "deceased".

SAMMON, WAYNE WILSON, 66 — passed away March 22, 2001 of heart disease at Hemet Valley Medical Center. Obtained from a Hemet obituary sent in by Robert Williams.

SAVIDAN, JOHN L, 73 — of Rancho Mirage, CA, died November 20, 2000. He was a retired plant manager for Autonetics. Obtained from an obituary in an Orange County newspaper.

SCHENDEL, JAMES WALTER, 84 — of Fountain Valley, CA, died January 23, 2001, of heart failure. James worked as an aerospace engineer for 33 years, the last ten, of which were spent working on the Space Shuttle Program for Rockwell International, until his retirement in 1983. Obtained from an obituary sent in by Maxine Haun.

SIMPSON, DON B. — passed away May 28, 2000, from complications following triple by-pass surgery and heart valve repair. Don retired from both McDonnell and Rockwell International. His wife, Shirley Simpson, notified us.

SIMPSON, JONES, 78 — passed away August 6, 2000, in Redondo Beach, CA. He worked for North American Rockwell for over 44 years in sheet metal manufacturing at LAD. Information from John Perreault and an obituary in a local paper sent in by Maxine Haun.

SMITH, ERNEST F, (PAT), 86 -- of Sevierville, TN, died August 24, 2000 at Ft. Sanders Sevier Nursing Home. He worked at Rockwell, LAD, D/41 as a maintenance mechanic. He transferred to Fresno Division where he retired and moved to Sevier County, TN over 20 years ago. John E. Horning of Seiverville, TN sent us the information.

STAMPER, ORVILLE, 94 — worked for Rockwell International from 1962 to 1974 and passed away of congestive heart failure on February 1, 2001. After retirement, Orville and his late wife, Grace, turned a hobby of buying and selling antiques and collectibles into a full time career that spanned more than 25 years. Information from an obituary in an Orange County newspaper sent in by Maxine Haun.

STARKWEATHER, E. D. — death reported by his niece, Susan Ochoa. No other information was available.

Silent Majority

STOFFEL, LESTER (LES), 78 — passed away on January 4, 2001, in Galt, CA, of a heart attack. Les worked at the Space Division for more than 38 years. Many of those years as supervisor of the GSE Tubing Department. He retired in 1984. Marshall Gullett notified us.
STOUT, DICK — passed away May 1, 2000, in Elkton, OR. Dick was in Quality Control management at LAD for many years. Neel Weddle, Grandville, WA, notified us.
SUAREZ, CECIL JOE, 62 — of Huntington Beach, CA, an electronics inspector and union representative for Rockwell International, died November 18, 2000 of a heart attack. Obtained from an obituary in an Orange County newspaper.
THOMPSON, RONALD H. — passed away February 18, 1998. We were notified by his wife, Doris, Seal Beach, CA.
TILCUNOFF, TANYA, 63 — of San Juan Capistrano. CA, an administrative assistant, died December 4, 2000, of cancer. Terry Nieuwlandt notified us.
TOMAC, EVAN — passed away January 21, 2001. Evan worked in production and experimental planning for many years. Rex Tabor notified us.
TRAVIS, BILL — passed away December 27. 2000 from heart failure. He retired from Rocketdyne after 41 years of service.
TUTTLE, ROBERT — passed away on November 24, 2000, after suffering from cancer for a year. Wilma Llewellyn notified us.
TYSKO, SIGVARD O, 83 — died on March 3, 2001 in Rancho Mirage, CA, after a courageous battle with cancer. He spent all of his adult life in Southern California, working many years for North American Rockwell. Maxine Haun notified us.
VANE, GEORGE — of Contracts & Pricing (D/098) passed away recently. Marilou Derocher notified us.
WEBB, BERTHA — passed away on December 10, 1999 in New Albany, Indiana. She worked in Facilities and Industrial Engineering. Her son, Ronald, notified us.
WEGELIN, HERMAN WALTER, 76 — died on March 18, 2001 of heart disease in Hemet, CA. He was an electrician for 30 years at North American Rockwell in Anaheim. The obituary from a local Hemet newspaper was sent to us by Eugene Somers.
WEIZER, HILDA — passed away November 9, 2000, in Gardnerville, Nevada, after a long-term illness. Hilda was a secretary in Engineering at LAD. We were notified by LaJuana Rainer, LAD Purchasing.
WHITE, PHYLLIS — Los Angeles Division Supply Support, passed away in Los Angeles in October 2000. Robert H. Johnson, Manhattan Beach, CA Beach, notified us.
WHITFIELD, LENORE J., 75 — of Orange, CA, a retired aerospace worker for North American, died December 2, 2000, of kidney failure. Obtained from an obituary in a local paper.
WILSON, HAROLD LANE, 87 — of Mission Viejo, CA. a chemical engineer for North American, died January 21, 2001, of cancer. Information from an obituary sent in by Maxine Haun.
WILSON, MEL — died on March 3, 2001 of cancer and the effects of radiation and chemo. His friend Don Wegner notified us.
WINSLOW, WILLIAM — died January 14, 2001 in Palm Springs, CA. He worked at LAD.
WOLKING, DONALD HENRY — died January 7, 2001 following a motor vehicle accident. He was a retired engineer from Rockwell International and Aerojet General. Information from an obituary from an Orange County paper.
WRIGHT, GAIL DAVID -- passed away November 19, 2000. He retired from Palmdale with over 30 years. La Verne Corson notified us.
WRINKLE, D. C. "CHARLIE", 90 — passed away December 8, 2000, from pneumonia. Charlie worked at LAD in Engineering and later on in the GEP section of Purchasing. He was living in Manhattan Beach when he retired but moved to St. George, Utah in 1990. Loyce Solomon, St. George, UT, notified us
YORGIADIS, ALEXANDER JOHN, 85 — of Anaheim, CA, passed away July 21,2000, of Parkinson's disease. He was a retired mechanical engineer for Rockwell, International.
ZAPF, ARTHUR C., 71 — an electronic engineering manager at Rockwell, died February 11, 2001, of congestive heart failure.

PAX DOMINI SIT SEMPER VOBISCUM

TWIN MUSTANG P-82 AT EL CAJON

Last November, the Confederate Air Force (CAF) Air Group One based at Gillespie Field in El Cajon, California transported an NAA P-82B from CAF Headquarters in Midland, Texas where it had been in storage ever since it crash-landed more than a decade ago to its hangar at El Cajon. The transfer was the result of several years of fund-raising by Air Group One and the sponsoring P-82 Squadron.

The plane was airlifted to MCAS Miramar in San Diego by an Air Force C-5 Galaxy. Although it was disassembled for the move, it still presented a challenge for the movers. With the wings removed, the main twin fuselage section is more than 18' wide, 10' high and 38' long. When it was rolled out of the nose of the C-5 there was barely a foot of clearance.

The P-82 was lifted by a crane at Miramar on to a special iron cradle for transport to Gillespie. The wings were moved by trailer. The airplane was escorted by the California Highway Patrol and arrived at the Air Group One hangar in good condition where it was towed into the hangar.

The CAF aircraft is an F-82B, S/N 44-65162 and N12102. It was discovered at Lackland AFB in San Antonio, Texas in 1966. Mounted on a plinth, it was in sad shape after 15 years of exposure to the elements. It was transported to Kelly AFB where it was restored to airworthy condition and ferried to CAF Headquarters in Harlingen, Texas in January 1969.

It appeared in several airshows but plagued by engine problems, the P-82 belly-landed at Harlingen in October 1987. The biggest problem with trying to restore the airplane was to find funding and a propeller for the counter-rotating right engine.

Once restoration is complete, it will become part of the World War II Flying Museum at Gillespie Field and it will be the only flying P-82 Twin Mustang in the world. It is one of only five in existence. Two others are owned by a private collector, one is at the Air Force Museum in Dayton, Ohio and one is on display at Lackland AFB.
Development of the P-82 was spurred by the urgent need for a two-man long-range escort fighter in the Pacific. NAA engineers started with two lengthened P-51H fuselages, each powered by an 1,860-hp Merlin V-1350 engine. In addition to modified wing halves, a new center wing section and tailplane were designed and implemented.

Although the plane had dual controls, the pilot sat in the left fuselage and the radio/radar operator in the right. It had a maximum range of 2,200 nautical miles. A total of 273 were built. Too late for WW II, the F-82B was used as a night fighter in the Korean War. In June 1950, Lt. William Hudson scored the first aerial kill of the war in an F-82G.

Story and Photo by Chuck Stewart, Pacific Flyer, Oceanside, CA

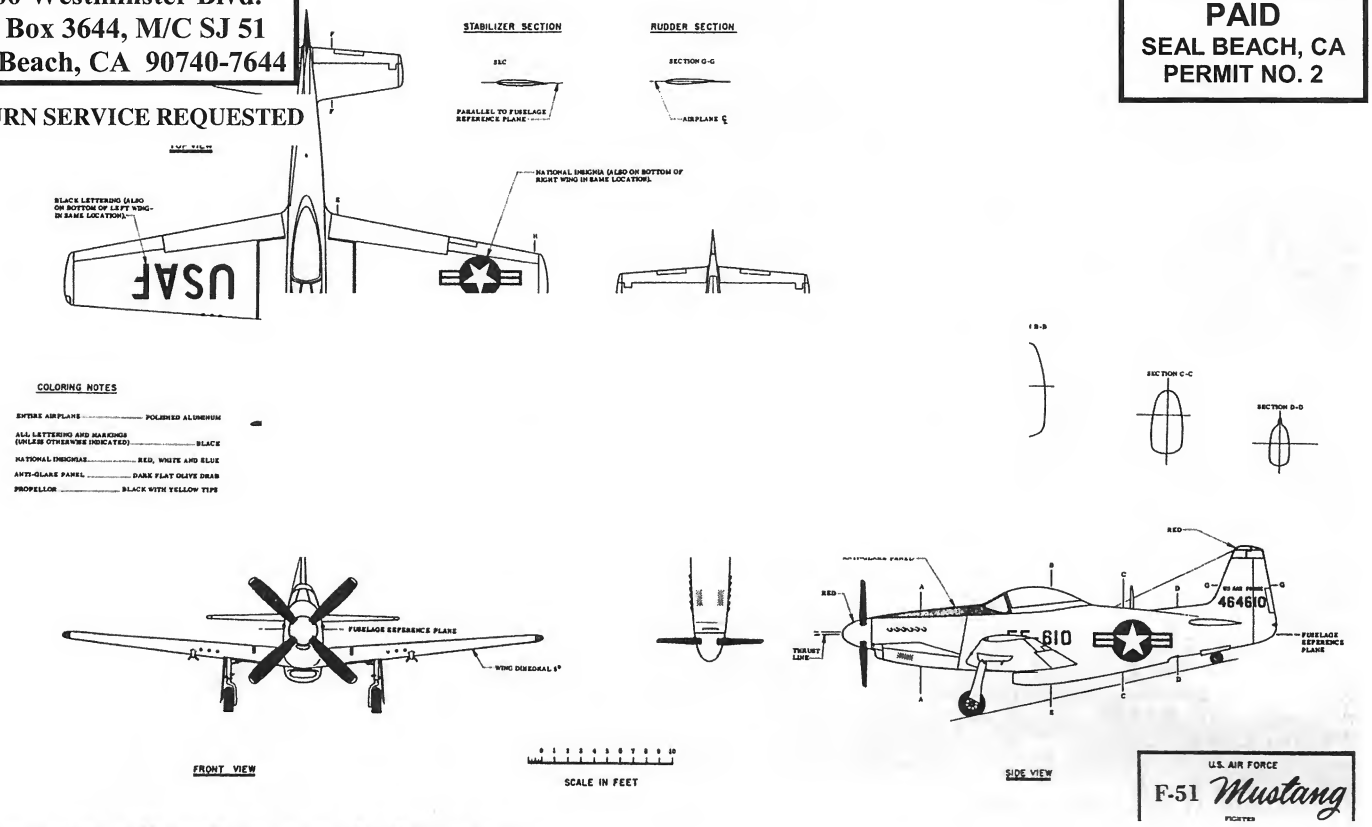
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TWIN MUSTANG P-82 FUSELAGE AT EL CAJON

Story inside back-cover

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION

Retirees Bulletin

SUMMER 2001

Inside:

THE NORTH AMERICAN AVIATION B-25H PROJECT NA-98X

EXCERPTS FROM THE SPEECH **"THE ACORN DAYS"**

THE HUN ALSO RISES

THE VALKYRIE AIMS HIGH



THE B-25H #43-4406 RETROFITTED WITH THE R-2800-51 ENGINES AND A-26 COWLINGS IN SUPPORT OF PROJECT NA-98X

NORTH AMERICAN AVIATION
Retirees Bulletin

DEAR NAA RETIREE BULLETIN SUBSCRIBERS

We sent out 9000 copies of the Winter 2000 issue and over 2800 of you chose to subscribe! The roster of Silver Eagles continues to grow, currently 8% of you subscribers are life members! What is more important, your letters indicate that you are pleased with our efforts.

However, we did receive one blistering phone call from a subscriber because we left out the passing of her friend, a retired secretary, from the Silent Majority. The implication being that because she was only a secretary, we purposely slighted her name. Nothing could be further from the truth! This was an error of confusion and not of omission! We treat the passing of all retirees, regardless of their status on earth, with equal sadness and dignity! We know that Donna Lewis is with the angels and that she has forgiven us. We say that because if she was a secretary at NAA/Rockwell she already was an angel!

As you may have noticed, the NAA Retirees Bulletin has made some major advancement in the past three issues. The entire bulletin is now computerized and sent to the printer on a disc. The addressing is also on a disc and printed directly on the bulletin by a direct mail vendor. This has eliminated much of the volunteer manual operations and we are now free to dedicate our attention to the contents and quality of the bulletin itself.

Although we know that many of you first turn to the Silent Majority. We also know that you want to read about the important and interesting programs and events that were part of North American Aviation and Rockwell history, not only at LAD but at Space, Autonetics, Rocketdyne, Atomics International, Columbus, Tulsa, Palmdale, Edwards AFB and the Kennedy Space Center. Therefore, we are seeking out the people who were there to help us record these happenings. In this issue, Norm Avery, a recognized author and NAA engineer, provides us with a very colorful chapter about the B-25. We invite other hands-on historians with a story to tell, to take the time and put it down for others to enjoy. The pay is terrible but the gratitude is immense!

In keeping with this goal, we garnered the services of Dr. Raymond Puffer of the Edwards AFB History Office. He is already on the job and has submitted several articles about NAA aircraft.

Our Spring 2001 Issue went out to all subscribers and we already received almost a dozen returns because the recipient moved and did not notify us. If we are lucky and the post office provides a forwarding address, it costs us 55 cents to re-send the bulletin. If you change your address, please let us know so we can promptly update our mailing lists.

We also received many calls because the Post Office took its sweet time to deliver the NAA Retirees Bulletin in certain areas. Once it is turned over to the Post Office, we have no control regarding delivery. Evidently, several trays containing the bulletins were misplaced and not delivered as addressed. To resolve this problem, we went to first class mail with this Summer Issue. It is more costly but everyone gets their copy at the same time!

In closing, we are pleased with the 2800 that chose to subscribe but we are sorry for the 6200 that did not. We think that they will miss out on some great articles and stories. If you know any of these people, you may want to take pity on them and send them a gift subscription! In any case, God Bless you all!

NAAR is an affiliate of the **Bald Eagles, Inc.** and is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAAR office is located at Boeing, Seal Beach facility. Send mail to:
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Seal Beach, CA 90740
Or call: ☎ (562) 797-3836
Or Fax: (562) 797-3848

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(562) 797-3836

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MEMBERSHIP FORM

Yes, I am a retiree of NAA/Rockwell and I want to be a member and receive the NAA Retirees Bulletin. I am enclosing a check payable to the Bald Eagles, Inc. for $ _____
For every $10.00, I will receive four issues.

Name _____
Street Address _____
City/State/Zip _____

I retired from_____ Division
After _____ Years of Service

You may also send a gift subscription to another NAA retiree. Just give us the name and address of the recipient along with your payment and we will send a gift card to him

MOVING? ON EXTENDED VACATION?

If you are moving or you are "Snowbirds" taking an extended vacation at another location, please let us know your new address as soon as possible.

We receive several dozen returns with each issue indicating the subscriber has moved — sometimes with a new address on a yellow label and sometimes with the rather somber "Address Unknown". It is not clear whether the recipient has joined the "Silent Majority" or is out there somewhere?

For you "Snowbirds" — Your Bulletin is returned to us stamped with "Temporarily Away" with no indication when you will return. So please give us your new address as soon as possible and send the information to:

NAA Retirees Bulletin
2600 Westminster Blvd
PO Box 3644, M/C SJ51
Seal Beach, CA 90740

NAA/ ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Bill Kelley at (714) 637-9374
TheAntelope Valley Retiree Club meets temporarily in Courson Park at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell retirees are welcome. For information call Bill "Tiny" Kisler at (661) 273-0213.
The Boeing Valley Retiree's Club meets on the 3rd Thursday of each month at the Canoga Park Rec. Center. 8500 Fallbrook Ave. Canoga Park, CA. President: Jennie Muncaster, dial (818) 341-8919
Autonetics Retirees meets for lunch at 11:45 AM on the 2nd Wednesday of each month at the Rembrandt Restaurant, 909 E. Yorba Linda Blvd., Placentia CA. All Autonetics retirees, spouses and friends are invited.
"Ye Olde Pharts Breakfast Club" - A group of retired Autonetics Quality personnel meets for breakfast on the 4th Thursday of each month at 10 AM at Coco's on Tustin Ave. and Lincoln Blvd. In North Orange. For information, call Don Metzger at (949) 495-5374.
A group of NAA Retirees meets for breakfast on the 1st Wednesday of each month at the Knott's Berry Chicken Farm Restaurant at 8:15 AM. All are invited.
A group of Retirees from Seal Beach meets at 11:30 AM at "The Fish Co", Los Alamitos and Katella, on the 3rd Wednesday of each month. For more information, call Marvin Blaski at (714) 848-5717 or e-mail: mblaski@aol.com
"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meets for lunch on the 2nd Wednesday at 11:30 AM at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd and Mariposa Ave.
"The Old LAD Stress Group" meets approximately every two months at Mimi's Café in Torrance, CA for breakfast. If you were in the old LAD Stress Group and want to join them, contact Gene Laxton (310) 378-3113 or Ed Rosenthal at (310) 375-8933
The Downey Engineering Group of Retirees known as "The Choir Boys" meets every Thursday for lunch at various restaurants from Seal Beach to Downey. Call Al Risi at (714) 892-5725 for meeting location.
GPS Breakfast Club meets every Wednesday morning from 6:00 to 8:00 AM at the Primrose Restaurant at the corner of Seal Beach Blvd and Westminster Blvd. All are invited, retired or not.
The Facilities, Industrial Engineering and Plant Services Retiree Group meets on the 2nd Thursday each month at the Jolly Roger in the Long Beach Marina at 11:45 AM. Friends and wives, former and current employees are welcome.
The North American Rockwell Retirees Club of McAlester Oklahoma (a satellite of Tulsa, OK) meets each month on the 3rd Tuesday, 10:30 AM at the Down Town Meeting Place. For more Information contact:
J. A. Darden, 343 W. Adams Ave. McAlester, OK 74501 or phone (918) 423-0706.
Tulsa & McAlester Retirees meet for breakfast at 8 AM on the 2nd monday of March, June, September & December at the Harvest Buffet, 3637 S. Nemovial Drive, Tulsa. Call Harry Phillips for more detail at (918) 838-3716.
The North American Rockwell Retiree Group of Columbus, OH. Engineers and Professionals meet each month on the 3rd Thursday at 11:30 AM at the Berwick Park House. For more info. contact Byron C. Solomides at (614) 486-3239.
NAA/Rockwell U.A.W. Group of Columbus, OH, meets on the 1st Monday of each month at Noon at the Old Rockwell Park (North Hamilton Rd.) E. Hamilton at (740) 927-5940.
Autonetics Group that includes Marine Systems, Program Office, Project Office, System Test, Engineers, Designers, etc. meets for lunch on the last Wednesday of each month at the Hometown Buffet, Rose Avenue and Alta Vista Drive in Placentia. For more information call Mike Vohs at (714) 762-1925.
A group of NAA Retirees from 101 Tooling meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at the Cimarron Café at 5160 190th St., West of Anza Avenue in Torrance.
Autonetics Finance Luncheon. This group meets for lunch the last Wednesday of the month at Carrow's located at 100 N. State College in Fullerton. Anyone interested can call Ken Cantwell, at (714) 970-7171 or send e-mail at: kcantrell@prodigy.net, to obtain more information.
Autonetics Industrial Engineering and Maintenance Retirees meet for lunch the 1st Thursday of each month at the Hometown Buffet, 390 McKinley, located in front of Home Depot, in Corona. For more information call Don Burt at (909) 698-0072
NAA Tech Reps Assn. (TRA) Breakfast Club meets the 1st Tuesday of each month at the Carlsbad Airport Restaurant at 9:00 AM.
For more information call: El Presidente, Rafael Colunga at (760) 940-0525
A Group of Engineers Mgt. , meets on the 3rd Tuesday monthly at Denny's on Imperial Hwy and 57 Fwy. at 11:30 AM for lunch. For more information call Ed Moran at (562) 697-9949
Autonetics Flight Control Retirees meet on the 3rd Thursday of every month, except December, at 11:30 AM at "The Lamppost Pizza House" located at 17568 Yorba Linda Blvd. corner of Richfield Road in Yorba Linda.
Call Jim Anderson at (714) 779-5620 for more information.

ANNUAL EVENTS

The "Warbird Round-Up", sponsored by the Santa Maria Museum of Flight - September 14th - 15th, 2001 at the Santa Maria Airport
Bald Eagles Reunion - The 39th Annual Reunion is on April 21, 2001, call Val Yarbrough at (805) 646-2283
Grants Pass Picnic - 1st Wednesday after Labor Day, September 5, 2001
NAA-K B-25 Reunion will be held on Sunday, August 19, 2001 from 1 to 5 PM at the Wyandotte County Museum. For more information call Harry J. Desko (913) 287-7223 or write to him at 3024 N. 47th St., Kansas City, KS 66104.
Flying Horsemen For year 2001, information regarding events and reunions may be obtained from the troop secretary, Harold Shapiro at (714) 993-3496, FAX (714) 993-1208, e-mail shapsplace@aol.com or mail to 17822 Kennon Dr., Yorba Linda 92886
The Hangar Gang - This group of retirees meets approximately every 6 months. For time and date or additional information call Gene Salvay (818) 788-3974, or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.
Annual Flight Test Instrumentation Reunion - This group of retirees meet annually at the Fullerton Elks Club. For Information call Ed Mosbrook at (714) 531-8060 or Frank Vigil at (562) 691-0236.
Tech Rep Association—a group of retired Field Service Technical Representatives has a yearly picnic in June at the park in Fallbrook. For more information, contact the TRA President Rafael Colunga, 5705 Redondo Dr., Bonsall, CA 92003 or at his e-mail address: rafael@nctimes.net
The Annual M&P, P.D.L., "Friends Christmas Luncheon". This group of retirees (and some still employed) have assembled in mid-December for a festive luncheon and gab-fest for the past 18 years. The last two luncheon were at South Bay Grill and Luig's.
Those wishing to receive notice of next December Luncheon, please call Fred Koeller at (310) 545-8854.
2001 Group Reunion Luncheon for TRI-STATE Members - This group will meet on Wednesday, October 17, 2001at 11:00 AM to 3:00 PM (PST) at the Lancaster Elks Lodge #1625, 240 East Avenue K. Lancaster, CA 93534. For reservation call one of the committee member : Bill Bright at (661) 943-7276 or Steve Carlson at (661) 944-9698 or Jim Beall at (661) 945-1326
E-mail: bbright@hughes.net E-mail: Stvnvee@msn.com E-mail: jjbell@as.net
Saturn S-II Reunion - will be held on May 4 th or May 18,, 2002 at the Grand Hotel in Long Beach, CA. Those interested in paticipating or attending should contact Al Otto at (714) 775-4721 or e-mail him at gypsyma@aol.com.

Continued on page 4

The Editor's Corner

CLARIFICATION ON U. S. SAVINGS BONDS

This is an update on the "U.S. Savings Bonds Have Limits" column that appeared on the Editor's Corner of the Spring Issue.

The first U.S. Savings Bonds Series EE issued January 1980 will reach final maturity on January 2010 (30 years), presently the $25 Bonds are yielding 7.45% with a redemption value of $116.

U.S. Savings Bonds Series E have different final maturity terms (30 and 40 years).

Forty years $25.00 Bonds issued May 1941 through April 1960 have a final maturity value from $90.00 to $192.00. Also $25.00 Bonds issued from may 1960 through May 1961 have a final maturity redemption value from $192.00 to $201.00.

These Savings Bonds are not eligible for exchange to series "HH" Bonds.

Other bonds issued in 1961 through November 1965 will reach maturity 40 years later from the date of issuance, i.e. during 2001 through November 2005.

Thirty-year $25 Bonds issued in December 1965 through April 1970 have a final redemption value from $128.00 to $137.00. Also $25 Bonds from May 1970 through 1971 will reach their full redemptions values from $127.00 through $137.00.

Bonds issued in 1971 trough June 1980 will mature in full in 2001 through 2010.

This information is from the Tables of Redemption Values issued by the Department of Treasury Bureau of the Public Debt.

To obtain these yearly booklets, you must submit your subscription to the Superintendent of Documents, U.S. Government Printing Office, PO Box 371954, Pittsburgh, PA 15250.

The Phone number is (202) 512-1800.

A subscription is for two issues per year. The first is from March through August and the second is from September through February.

The cost is $12 per subscription, you must submit it by check or money order sixty prior to the first issue.

Series "E" stock number TRVE # 748-13-00000-8: series "EE" stock number TRVEE # 748-14-00000-4.

Send us mail for the Mail Bag—Andy Tindley is waiting for your letters. Also don't forget that you can put ads in the Mail Bag if you have something that you want to sell or that you want to buy (No charge for this service, OK!).

Miscellaneous Information

All NAA / Rockwell / Boeing Retirees that have a need to contact the BNA Benefits Center must have their Personal Identification Number (PIN) available before attempting a call to the Center.

The telephone Number is 1-800-438-3116. The business hours are from 10 AM to 6 PM (EST) M through F.

If you don't have one or forgot your PIN, you must write to the Center:

BNA BENEFITS CENTER
PO Box 24567
Jacksonville, FL 32241-4567.

Services provided by the Center are:

Life events, enrollment or change in medical/dental plans, address changes, plan comparisons of medical benefits, answers to general health/dental/vision and life questions, health care/Life Insurance direct billing procedures and confirmation statements.

The above information does not apply to retirees from the Rockwell Corporate Offices. These former employees remain under the Rockwell Corporation benefits and pension plans

Other Services Available to Retirees

The Boeing California Employee Fitness, Inc. location at Seal Beach is available only to Retirees. To access the facility, retirees must exchange their Retiree Card for a temporary "Retiree" badge at the Gate 510 Security window on Westminster Blvd.

However, the fitness centers at Anaheim and Huntington Beach are now open to retirees and their dependants On your first visit, stop at the office and fill out a short form and receive a dependant card.

Discount tickets to recreation parks are no longer available at the Fitness Center. However, there is another source available. For Employee Services discount tickets:

www.Boeing.esvp.com/, if you have internet, if not: call 1-877-641-7283

Retirees on tours wishing to rent a car can benefit from the Boeing Corporate Discount.. The company negotiated contract agreements are: No. 5555501 for National and No. 147616 for Alamo.

Refer to the pertinent number when negotiating a rate for car rental at National or Alamo. Have your retiree ID card with you all the time

Dear Readers

It is with regrets that I must inform you, readers and supporters, that I will be resigning from the position of Editor of the North American Aviation Retiree Bulletin as of December 31st 2001.

I have been a volunteer Retiree News staff member since 1990 and took on the position of Editor in 1994 following the relocation of the office from LAD to Downey and I will continue on the staff for the next three editions in order to give ample time to locate and instruct new replacements.

In order to continue the publication of the Bulletin, as is, one must be capable of operating a computer to the fullest and be proficient with Windows 98, Microsoft Words and Microsoft Publisher, he must also have a scanner at his disposition and be able to work with graphics and photos. A CD Writer is also required to transfer the entire content of a bulletin issue from the hard drive to the disc. This is now the accepted method for publishing. The days of "cut and paste" and photocopy methods are over.

My sincere thanks to all my dedicated staff members that includes: Walt Jones, Gloria Farquhar, Ed Rusinek, Ken Fowler, John Flavin, John Markel, Andy Tindley, Maxine Haun, Howard Axtell, Sonnie Robertson, Jo Ann Kock, also, our treasurer, Val Yarbrough and Technical Advisors, Mike Davis, Joe Onesty and Robert Nease.

We have worked hard for the continuation of a retiree newspaper and we sincerely hope that it will continue to be published and grow.

Also, one of my best friends, Co-Editor Walt Jones has expressed his desire to retire from this staff at the end of this year. Walt has been on the Retiree News staff since 1984, and was chosen as Co-Editor in 1994. Walt has always been a faithful and dedicated volunteer, he has devoted his time mainly on the "Silent Majority" and we all owe him a ton of gratitude for his invaluable help.

Declining health, change of priorities in our lives and personal reasons among other considerations, prompted this action.

We wish the best of luck to the staff and to the future Editor and Co-Editor of the Retiree Bulletin.

Respectfully yours,

Michel Juif, editor

The Grants Pass Picnic will be on September 5, 2001. Don't miss it. For more information and how to get there, call either Gil Judson at (541) 582-0675 or Bob Morse at (541) 474-1438.

The **"Warbirds Round-Up".** A special program for NAA/Rockwell/Boeing employees and retiree will be held at the museum on Friday, September 14th at 1:00 PM. Any NAA memorabilia for display would be greatly appreciated. For more information, contact Marv Nichols at (805) 925-1349

THE NORTH AMERICAN AVIATION B-25H PROJECT NA-98X

BY NORM AVERY

A question frequently asked: "Has North American Aviation ever produced B-25s powered by Pratt & Whitney R-2800 engines?" The answer is an emphatic "No". However, at the request of Wright Field Engineering in early 1944, the Inglewood Division did retrofit a single B25H with R-2800 engines as Project NA-98X.

The reasons for the Army Air Force request were not made clear but in all probability the AAF was growing impatient with the delays in getting the Douglas A-26 into production. The A-26 was scheduled to replace many of the B-25s in the Southwest Pacific Theater.

General George Kenney, commander of the 5th Air Force in the Pacific, was willing to finish the war with his B-25s and offered several criticisms of the A-26. He also expressed doubts that at its current rate of development, the A-26 would even be ready for "this war". There was obvious support from Wright Field with the view of a production contract since the basic airframes were already being produced in large numbers at both Inglewood and Kansas City and would cost much less than the new A-26.

In response to the AAF request, NAA began modification of B-25H #43-4406 accompanied by a proposal defining three production configurations: a conventional medium bomber and two attack strafer bombers, all powered by P & W R-2800-51 engines using Bendix Stromberg carburetors with water injection. One strafer variant utilized the factory eight-gun nose, two .50 cal waist guns and carried four 500-pound bombs. The so-called "super strafer" carried the same armament plus four more .50 cal guns in forward fuselage blister packs. This was the heaviest design at 35,522 pounds.

The only visual differences from a standard B-25H were the high-speed inlet A-26 cowlings, large propeller spinners and the squared P-51 type wing tips. The wingspan remained unchanged at 67 feet 6.7 inches. The revised tip shape permitted a 12 inch increase in aileron span; thereby, increasing the aileron area by one square foot.

Based on a gross weight of 34,000 pounds, calculations indicated a top speed of 300 mph at military power and a rate of climb of 1800 feet per minute at sea level. Predicted high speed at emergency power was 325 mph.

The additional power and speed of the revised airplane, combined with increased aileron area, redesigned controls reducing stick forces and increased roll rate would require considerable structural reinforcement of the nacelle and wing structure for production units. These changes plus the heavier engines would add 1,500 pounds to the gross weight. The higher maneuvering speeds could induce excessive bending moments in the wings. To counter leading edge torsion, the rivet size was increased for the attachment of the leading edge skins.

The required flight test data could be safely obtained without the structural reinforcement by imposing restrictive parameters. Maximum speed for all test flights was, therefore, restricted to 340 mph IAS and a normal acceleration of 2.67 g. Except for removal of the forward fuselage gun packs, the standard B-25H armament was retained on the NA-98X during the entire test program.

Accompanied by test engineers Talman and Johnson: NAA engineering test pilot Joe Barton made the first flight on 31 March 1944, a one hour functional check. Fifteen more flights were made through 20 April 1944 by Barton, chief test pilot, Ed Virgin, RAF Squadron Leader Hartford and AAF pilots Major McIver and Captain Fountain. All agreed that the improved performance clearly indicated that the B-25 should have been assigned the R-2800 engines from the beginning.

In 1944, Mines Field ended on the west at Sepulveda Boulevard, at the time a two-lane thoroughfare. Aviation Boulevard marked the eastern edge of the field, making the runway about a mile long. An anti-aircraft battery was located at the northwest corner of the field and the troops stationed there were avid observers of the NA-98X as flight-testing progressed. Some even had part time jobs with North American Aviation.

On 22 April 1944, the test program was taken over by Major Perry Ritchie and Lieutenant Winton Wey of the AAF. Ritchie was a graduate engineer and an experienced military test pilot but was generally known to be somewhat spectacular. After completing each programmed flight, he flew out over the Pacific Ocean, dropping low to just above the surface of the water. Then a hop over the Playa Del Rey sand dunes and "on the deck" at full throttle eastbound for the NAA flight ramp. His exhibitions usually ended with a steep pull up and climbing spiral before entering the landing pattern. Although, he was emphatically cautioned by NAA structures engineering and company test pilots, he chose to ignore their warnings to stay within established red line parameters.

On 24 April 1944, the troops on the field interrupted a ball game to watch another Ritchie low level, high speed run. They were not to be disappointed! Reaching the NAA flight ramp, he made the usual sharp pull up. At an altitude of about 200 feet, both outer wing panels separated and knocked the tail off. The airplane rose about another 100 feet and crashed a little northeast of the present site of the Proud Bird Restaurant. Both crewmen were killed instantly. The airplane did not burn. The flight ramp and the camouflage netting above it were strewn with debris. One outer panel fell on the net intact, making for an easy analysis. That no one on the ground was hurt seems miraculous but such was the good fortune. The accident investigation report concluded that the airplane was simply flown beyond its structural limitations.

The North American Aviation Project NA-98X is a classic example of a victim of circumstances! The tragic and unnecessary crash precluded any possibility of a production contract. A historically common result even when the airplane was found not to be at fault. At the time, this type of B-25 had valid applications. Victory in Europe was a year away and Japan remained a formidable foe against whose forces the B-25 had proven very effective. Had the crash not occurred? I believe there was an excellent chance that a production contract would have been issued. I well remember this airplane since I made the drawings for the exhaust collector for the upper cylinders. The evening of the crash I was able to enter the crash site escorted by an officer friend from the AA battery whose troops also guarded the wreckage.

ABOUT THE AUTHOR

Norm Avery joined NAA in 1944 as *a draftsman in the Engineering Power Plant Group working on the B-25, P-51, AT-6, XAJ-1 and numerous other aircraft including the B-70 and B-1. He retired in 1980 from the Energy Systems Div in Canoga Park after some 12 years of mechanical design in support of atomic energy. Norm has contributed numerous scholarly articles to the Journal of the American Aviation Historical Society and has written two books. He is the author of:*

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and

B-25 MITCHELL, THE MAGNIFICENT MEDIUM.

Both books are available from Markiewicz/Thompson at (714) 542-7145. Jon Thompson will give a special rate for NAA retirees so call for particulars. Norm now resides in Mt. Shasta, California.

THE ACORN DAYS

BY DENHAM S. SCOTT

How many of you know that in 1910 the mighty Martin Marietta Company got its start in an abandoned church in Santa Ana, CA? That's where the late Glenn L. Martin with his mother "Minta" Martin, and a mechanic named Roy Beal, built a fragile contraption with which Glenn taught himself to fly.

It has often been told how the Douglas Company started operations in 1920 by renting the rear of a barbershop on Pico Boulevard in Los Angeles. The barbershop is still there. The Lockheed Company built its first Vega in 1927 in what is now the Victory Cleaners and Dyers at 1040 Sycamore Avenue in Hollywood.

Claude Ryan, who at 24 held a reserve commission as a flyer, had his hair cut in San Diego one day in 1922. The barber told him how the town aviator was in jail for smuggling Chinese across the border. Claude investigated and stayed on in San Diego to rent the old airfield from the city at fifty dollars a month and replace the guy in the pokey. He agreed to fly North instead of South.

In 1928, the Curtiss Aeroplane and Motor Company, Transcontinental Air Transport (now TWA) and the Douglas Company chipped in enough money to start North American Aviation, a holding company. The present company bearing the Northrop name came into being in a small hotel in Hawthorne. The "hotel" was conveniently vacant and available because the police had raided it and found that steady residents were a passel of money-minded gals who entertained transitory male guests.

After Glenn Martin built his airplane in the church, he moved to a vacant apricot cannery in Santa Ana and built two more. In 1912 he moved to 9th and Los Angeles Streets in downtown Los Angeles. Glenn Martin was then running a three-ring circus. Foremost, he was a showman who traveled the circuit of county fairs and air meets as an exhibitionist aviator; secondly, he was an airplane manufacturer. He met his payroll and bought his lumber, linen and bailing wire from the proceeds of his precision exhibition flying. His mother, "Minta" and two men ran the factory when Glenn was risking his neck and gadding about the country. One of these was 22-year old Donald Douglas who was the whole of his engineering department and the other was a Santa Monica boy named Larry Bell who ran the shop.

The third circus ring was a flying school. It had a land plane operation in Griffith Park and later at Bennett's Farm in Inglewood; and a hydroplane operation at a place that's now part of the Watts District. A stunt flyer named Floyd Smith ran it. One of his first pupils was Eric Springer, who later became an instructor and then Martin' s test pilot, still later the test pilot for the early Douglas Company, and then a Division Manager.

Between Eric and Floyd, they taught a rich young man named Bill Boeing to fly. Having mastered the art; Boeing bought a Martin biplane, hired Ross Stem, Glenn's personal mechanic, and shipped the airplane to Seattle. Later, when it crashed into the lake and Boeing set about to repair it, he ordered some spare parts from Martin in Los Angeles.

Martin, remembering the proselytizing incident with Ross Stem, decided to take his sweet time and let Boeing stew. Bill Boeing said, "To Hell with him", and told Ross Stern to get busy and build one of their own. Boeing had a friend named Westerfelt and they decided to form a company and build two airplanes. These two "BW" airplanes bore a remarkable resemblance to the Martin airplane which, in turn, had been copied from Glenn Curtiss. There seems to be a moral about customer relations and product support mixed up in this episode.

During WW I, a bunch of sharpies from Wall Street in New York got control of the Wright Company in Dayton and the Martin Company in Los Angeles. They merged the two companies into the Wright-Martin Company. They sent a young man named Chance Vought to be their Chief Engineer. Donald Douglas lost no time in quitting and went to work for the U. S. Signal Corp.

The Wright-Martin Company started building obsolete "Standard" biplanes and Hispano-Suiza engines, with the latter under a license agreement with the French Government. Martin told them what they could do with them, and took off for Cleveland, taking Larry Bell and Eric Springer with him. Having the backing of a baseball mogul to build a new factory, he was soon joined by Donald Douglas who went to work and came up with the design of the Martin Bomber. It came out too late to see service in WW I, but showed its superiority when General Billy Mitchell made everyone mad at him by sinking the captured German battlefleet. The deathblow to the allegedly Dreadnaught "Osfriesland" was delivered by the Douglas designed Martin Bomber.

At Cleveland, a young fellow called "Dutch" Kindelberger joined the Martin Company as an engineer. Also a veteran Army pilot from WW I named Carl Squier became Sales Manager. His name was to become one of the most venerable names in Lockheed history.

Back in 1920, Donald Douglas had saved $600.00 and struck out on his own. He returned to Los Angeles, found a backer, David Davis, rented the rear of a barber shop and some space in the loft of a carpenter's shop where they built a passenger airplane called "The Cloudster". Claude Ryan bought this a couple years later, which made daily flights between San Diego and Los Angeles with it. This gives Ryan the distinction of being the owner and operator of the first Douglas Commercial Transport, and certainly a claim to be among the original airline passenger operators.

In 1922, Donald Douglas was awarded a contract to build three torpedo planes for the US Navy. Douglas lived in Santa Monica, but worked in Los Angeles. Way out in the wilderness at what is now 25th Street and Wilshire Boulevard in Santa Monica, there was an abandoned barn-like movie studio. One day Douglas stopped his roadster and prowled around to investigate. The studio became the first real home of the Douglas Aircraft Company.

With the $120,000 Navy contract, Donald Douglas needed and could afford one or two engineers. He hired my brother Gordon Scott, newly over from serving an apprenticeship to the Martinside and the Fairey Aviation Companies in England. Gordon was well schooled in the little known science of Aviation by 1923.

My first association with some of the early pioneers occurred when I visited my brother Gordon at the barn at 25th Street. I found him outside on a ladder washing windows. They were dirty and he was the youngest engineer. There were no janitorial services at the Douglas Company in those days.

Gordon introduced me to Art Mankey, his boss and Chief Draftsman, and four of his fellow engineers. There was a towhead guy called Jack Northrop, a chap named Jerry Vultee, and a fellow named Dick Von Hake who was a reserve Army flyer. Jack Northrop came from Santa Barbara where he had worked during WW I for the Lockheed Aircraft Manufacturing Company. The fourth member of the Engineering Group was Ed Heinemann. They were all working on the design of the Douglas World Cruisers. Shortly afterwards, Jack Northrop left the Douglas Company in 1926. Working at home, he designed a wonderfully advanced streamlined airplane. He tied back with Allan Loughead who found a rich man, F.E. Keeler, willing to finance a new Lockheed Aircraft Company.

ACORN Page 7

They rented a small shop in Hollywood and built the Northrop designed Lockheed "Vega". It was sensational with its clean lines and high performance.
In May 1927, Lindbergh flew to Paris and triggered a bedlam where everyone was trying to fly everywhere. Before the first Vega was built, William Randolph Hearst, publisher of the Hearst newspaper chain, bought it and entered it in the Dole Race from the Mainland to Honolulu, which was scheduled for 12 August 1927.
In June 1927, my brother Gordon left the Douglas Company to become Jack Northrop's assistant at Lockheed. He also managed to get himself hired as the navigator on the "Golden Eagle"; the name chosen by Mr. Hearst for the Vega which hopefully would be the first airplane to span the Pacific.
The race was a disaster! Ten lives were lost. The "Golden Eagle" and its crew vanished off the face of the earth.
With its only airplane lost under mysterious circumstances, a black cloud hung heavily over the little shop in Hollywood. However, Captain George H. Wilkins, later to become Sir Hubert Wilkins, took the Number Two airplane and made a successful polar flight from Nome, Alaska to Spitzbergen, Norway. After that a string of successful flights were to put the name of Lockheed very much in the forefront of aviation.
At Lockheed, Jack Northrop replaced the lost Gordon Scott with Jerry Vultee.
In 1928, Jack quit the Lockheed Company to start a new company in Glendale called Avion. Jerry Vultee then moved up to become Chief Engineer at Lockheed. He hired Dick van Hake from the Douglas Company to be his assistant. A young man named Cliff Garrett joined the Lockheed as the driver of their pick-up truck.
I went to work at Lockheed shortly after the "Golden Eagle" was lost. I became the 26th Lockheed employee. The Vegas were made almost entirely of wood and I became a half-assed carpenter, generally known as a ''wood butcher''.
In 1929, Jerry Vultee quit the Lockheed Company to start the Airplane Development Company, which became the Vultee Aircraft Company, a division of E. L. Cord, the automobile manufacturer. He later merged with Reuben Fleet's Consolidated Aircraft Company to become Convair. When Vultee left Lockheed, Dick van Hake became the Chief Engineer.
In the meantime, Glenn Martin closed his Cleveland plant and moved to Baltimore. His production man, Larry Bell, moved to Buffalo to found the Bell Aircraft Company. Carl Squier left Martin to tie in with the Detroit Aircraft Company 'which had acquired the Lockheed Aircraft Company and seven others. They hoped to become the "General Motors" of the aircraft business! They appointed Carl Squier as General Manager of the Lockheed plant, which moved to Burbank in 1928.
At this time, General Motors had acquired North American Aviation, which consisted of several aircraft companies in the East. Ernie Breech, formerly with Bendix but now with General Motors, hired "Dutch" Kindelberger away from Douglas to head up the aircraft manufacturing units. "Dutch" took Lee Atwood and Stan Smithson with him. The companies involved were Fokker Aircraft, Pitcairn Aviation (later Eastern Airlines), Sperry Gyroscope and Berliner-Joyce. Kindelberger merged Fokker and Berliner-Joyce into a single company and moved the entire operation to Inglewood, California.
Thus, a handful of young men played roles which profoundly affected all of our lives and the lives of millions of other Americans. They changed Southern California from a wasteland with a few orange groves, apricot and avocado orchards and the celluloid industry of Hollywood to a highly sophisticated industrial complex with millions of prosperous inhabitants. This technological explosion had some very humble and human beginnings. The "Acorns" took root in some strange places: a church, a cannery, a barbershop and a bawdyhouse, but from them mighty Oaks have indeed come to fruition.

From a speech given by Mr. Denham S. Scott to the AIA on March 19, 1968

DURING A RECENT VISIT TO THE HISTORY OFFICE AT EDWARDS AFB, STAFFER ED RUSINEK ENJOYED THE HOSPITALITY OF A MEETING WITH THE CHIEF HISTORIAN, DR. JAMES YOUNG, AND HISTORIAN, DR. RAYMOND PUFFER. IN ADDITION TO A TOUR OF THE FACILITY, ED OBTAINED THE USE OF HISTORICAL DATA AND PHOTOS FROM THE VAST RESOURCES OF THE HISTORY OFFICE, EVEN MORE IMPORTANTLY, DR. PUFFER GRACIOUSLY VOLUNTEERED TO WRITE FOR THE BULLETIN AS A GUEST HISTORIAN, THE MEETING TOOK PLACE IN FRONT OF A HUGE MONTAGE OF AEROSPACE MEMORABILIA MOUNTED ON THE CONFERENCE ROOM WALLS



In the picture, from left to right are:
Ed Rusinek, Dr. James Young and Dr. Raymond Puffer



5 Original Bald Eagles Charter Members from Dundalk, MD
L to R : Chan King, Al Purcell, Ralph Ruud, Willie Miller and Julius Kany



L to R: Glenn Penner, Val Yarbrough and Pat Cunningham



Keynote Speaker, Don Martin from Sea Launch



Ed Rusinek, Michel Juif, Bill Axtell and Shirley Axtell



L. to R.: Florence Hoffman, John Hoffman, Walt Jones and Gloria Farquhar



L to R: Lee French, Larry L. Pearson and Richard Van Slyke



Ed & Mary Jane Caustin with Jeanne & Joyce Crockett



John Wiedenhoefer and Norm Morton



L. to R.: Sonnie Robertson, Lou Tiberio, Carl Elyash



L. to R.: Carolyn Rodgers, Beth Addington, Jo Ann Kock and Sondra Williams



Bob McDonald, Don Koons and Al Schoenheit



Cordell Bussel and Jacob Kingswwold



Standing: Earl Theaker
Sitting: Maxine Haun, Jean Theaker & Doria Elmlinger



Walt Jones &Moonyeen Fowler



Moonyeen & Ken Fowler



Bill Klem



Don Cruz, Dick Jacobson, Ed Kaston Bernie Besich, Leon McGinnis & Dick Weiss



Jim Ball, Walt Opheim, Chas Feltz & Barney Weltz

THE HUN ALSO RISES

By Dr. RAYMOND L. PUFFER, Historian
Air Force Flight Test Center

A long-established convention was broken on 25 May 1953 when the new YF-100 ***Super Sabre*** exceeded Mach 1 on its very first flight. North American Aviation's chief test pilot George "Wheaties" Welch performed the feat. During the course of a 57-minute test hop, Welch leveled out at 35,000 ft. tapped the afterburner, and soon passed Mach 1.1. Supersonic speeds were already fairly common in 1953, of course, but what made this achievement different ---aside from happening during a first flight---was that the F-100 was the world's first production fighter designed to exceed the speed of sound in level flight. That same afternoon, the new fighter performed another impressive accomplishment. Instead of being grounded for several days of post-flight inspection, Welch took the YF-100 aloft again for its second consecutive supersonic flight.

There was no doubt that the new F-100---the ***Hun*** as it came to be called---was a very hot airplane indeed. Designed while the Air Force's F-86 ***Sabres*** were battling higher-flying MiG-15's in the skies over Korea, the F-100 was intended to be a fast, hit-and-run day fighter---thin wings swept at *45* degrees; low drag fuselage and canopy; inboard ailerons; low-positioned, one piece horizontal stabilizer. A thin-lip oval engine air inlet fed air to a single large Pratt and Whitney YF-57-P-7 continuous flow axial gas turbine engine rated at 13,800 pounds of thrust. The term "air superiority" had just been coined, and that was certainly what the Air Force and North American Aviation, Inc. had in mind for their new fighter. Fast it definitely was.

Following its initial flight, the airplane was dived on separate flights to calibrated Mach numbers of 1.35 and 1.40. On 29 October 1953, Lt. Col. Frank K. "Pete" Everest took the YF-100 to a world speed record of 755.15 mph at the Salton Sea---the last time such a record was set at low altitude. If all of this seems somewhat sedate by today's standards, it must be remembered that it all happened a scant *six* years after Chuck Yeager became the first human to fly beyond supersonic speeds in the same skies over Edwards AFB.

But this is more than a story about another very hot airplane at the Flight Test Center. The ***Super Sabre's*** spectacular debut also suggested to many in the aerospace world that the state of the designers' art had become more advanced than it really was. It seemed that all they had to do was to fly their aircraft on paper and in wind tunnels in order to solve all of the problems of high-Mach flight.

But test pilots and engineers knew that the air, even more than the sea, can be terribly unforgiving of even the slightest mistake---that conditions exist which neither design studies nor wind tunnels can easily uncover. When the first F-l00As came off the production line, they looked somewhat different than the prototypes---the tall stabilizer tips had been cut down. Design studies had indicated that a shorter, thinner, broader-chord vertical tail could reduce drag while maintaining effective directional control.

But the Unexplored Regions can bite! The short-tailed F-l00As very soon began to show problems with stability and control. Then, on 12 October 1954, George Welch was checking out the problems when his ninth-production F-100A disintegrated in a dive over Rosamond Dry Lake. He had encountered a new phenomenon that was later called inertial roll coupling---yawing and laterals control tendencies that could throw a plane out of control and quickly overstress the airframe. Two other fatal accidents quickly followed.

An exhaustive evaluation program was undertaken that soon identified the culprit, and all F-l00As were subsequently reconfigured with larger area tails. The skill and professionalism of engineers and pilots gave the Air Force a versatile fighter that served the nation well for many years thereafter.



F-100 *Super Sabre*

THE VAKYRIE AIMS HIGH

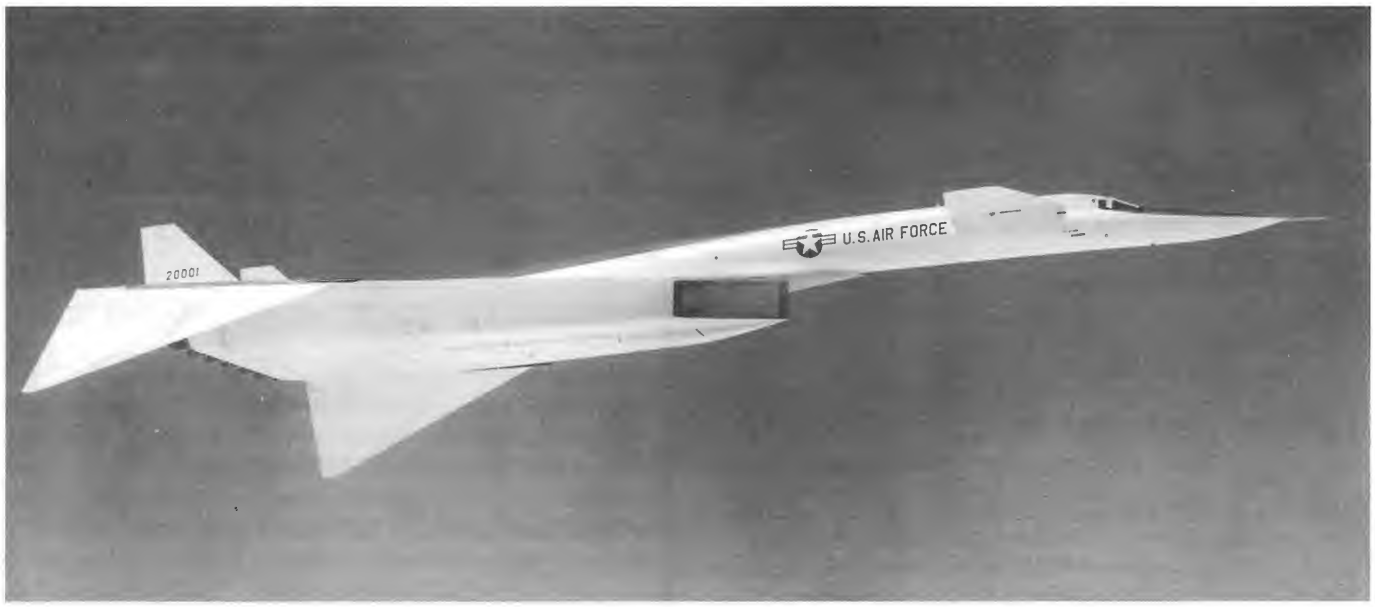
By DR. RAYMOND L. PUFFER, Historian

Air Force Flight Test Center

The fourth week in March seems to have a lot of significance for the XB-70 *Valkyrie,* the huge angular dart that seemed destined to become the world's first triple-sonic bomber. The concept of an attacker that could evade Soviet air defenses by flying far higher and faster than any interceptor then on the drawing boards was conceived in 1957. The AFFTC began preparing in 1962 for one of the most critical flight evaluation programs in its history. On 26 March of that year, AFFTC commander Maj. Gen. Irving L. Branch appointed Col. Guy M. Townsend as the XB-70 Test Director and assigned him a spot on his personal staff. However, even as the remarkable technological innovations for the ambitious project were rapidly coming together, the Soviet Union had already started a crash effort to build a fighter specifically to counter the new threat—the MiG 25. But even if the *Foxbat* with some 50,000 lbs. of thrust didn't pan out, parallel advances in missile development were making it unlikely that North American Aviation's giant airframe could ever outrun a missile attack. Consequently, by the time that Colonel Townsend assumed his post, the Air Force was radically changing its bomber doctrine: instead of high, fast, and bold, the next American bombers would slip into enemy territory following the nap of the earth. The XB-70 was scaled back from a bomber prototype to a Mach 3-research program. Only three experimental aircraft were ordered, and that was soon scaled back to two.

The Air Force still needed the advanced aerodynamic data that the new jets could provide, however, and only the AFFTC's expertise could certify them for the new research program. After the two gleaming whites *Valkyries* had arrived at Edwards, the mood on the Flight Test Center's ramp was brighter. North American's chief test pilot Al White and Col. Joseph F. Cotton brought the first XB-70 to Edwards from Plant 42 in Palmdale on 21 September 1964. On 17 July 1965, they ferried in ship number two. Once past the usual teething troubles, it was obvious that their performance was indeed extraordinary. Sustained flight at high supersonic speeds was the goal, and this the Valkyries began to do on a routine basis. One important milestone was reached on 24 March 1965, when Al White and North American pilot Van Shepard took the XB-70 on its first double-sonic flight. They went to 56,000 ft on that sortie, quickly reached Mach 2.14 (1365 mph), and flew beyond Mach 1.0 for 74 minutes—40 minutes of which were in excess of Mach 2.0. That was the day that Las Vegas, Nevada learned about the project. The supersonic bomber and its B-58 chase plane passed twice over the city, once at Mach 1.9 and again at Mach 2.1, slamming down a series of heavy sonic booms which flooded telephone switchboards and set off a memorable civic uproar.

In an era when most supersonic aircraft could exceed the speed of sound for only brief periods, the world suddenly had to come to grips with the prospect of very large aircraft making prolonged supersonic flights over their heads on a regular basis. Exactly one year later, on 24 March 1966, Lt. Col. Fitzhugh "Fitz" Fulton and Al White reinforced the issue. On that date, they took ship number two on its first long cross-country flight, from Edwards to Carswell AFB, Texas. The XB-70 research program was well on the way to its goal of sustained flight at Mach 3.0.



The XB-70A *Valkyrie*

CONTRAILS FROM THE PAST

by ED RUSINEK

Dear Ed,

The article about the Navaho project in the Spring 2001 issue of the retirees Bulletin brought back memories about the first use of titanium on that vehicle and the problems we encountered. As a Manufacturing Research Engineer, an engineer from Advanced Design introduced me to titanium. He showed me a 2" square of the metal and told me this would be a whole new era in airplane construction

The first parts made, using titanium, were heat formed into shape and appeared perfect. Two days later they developed horrendous cracks, which totally ruined the parts. A metallurgist suggested out gassing the titanium in a Space Division high temperature autoclave

This allowed us to form parts without cracks, however, drilling titanium was another major issue. The only practical way was to use cobalt drills and lots of coolant at the time; at the time Russia controlled all the cobalt so we had to buy the drills from their Soviet Satellite partners.

During a metal display at the Biltmore Hotel in downtown Los Angeles, I met George Shriver, the owner of "Molectrics" in Inglewood; he was demonstrating a new cleaning process with electrical controls. He didn't have any titanium so I provided him with a sample. He cleaned the metal and bent it to 90°, he subsequently placed the piece in a vise and completed the bend without any cracks.

The Summa process, as he called it, solved the cracks problem in titanium and this metal became, from then on, a major factor in aircraft design. Later, the Summa process was used to clean all the tubing and metal for the Apollo-Saturn program.

Finally, the German V-2 Rocket engines used diffusion bonding of steel to join metal sections together. They applied heat and a protective gas to cause the molecules to transfer and unite together to form a complete joint. Trying this process on titanium, we found that we could heat the stainless steel retort with encased titanium in an argon atmosphere to 1750° and bond the titanium pieces together.

Cordially, Lou Frost Laguna Hills, CA

Dear Ed,

I was pleased to see the centerfold photo of NAA's 1938 Engineering Department in the Spring 2001 issue. After Lee Atwood's passing, his personal contributions not given to the Smithsonian, were donated to the Santa Maria Museum of Flight. I identify and catalog all items associated with North American Aviation at the Museum.

Among the items received was a framed copy, with names on the back, of this same photo. It is the intent of the Museum Board to have a North American Aviation section in the new hangar and I hope to hang a series of photos of outstanding NAA individuals when the day comes ....

One learns many fascinating things from these old historical files. There is the story of Robert C. Chilton — "Mr. P-51". After completing his pilot training at Mines Field, he became a civilian flight instructor at Santa Maria for Army cadets and officers in training in October 1939. From January 1941 until March 1941 he ferried RAF Harvard trainers for NAA to Canada. After a check ride with Tex Wild, he joined NAA Flight Test as a company pilot.

Respectfully, John Henderson, Ventura, CA



Ed wouldn't have been standing under there if bombs were suspended above his head!

At the yearly Air Show held at Pt. Mugu NAS on April 1, 2001, staffer Ed Rusinek got a rare opportunity to examine the open Bomb Bay of the North American Rockwell B-1B "*Lancer*" bomber.

The plane and crew were from the Cheyenne Air National Guard. Because of fog and very low clouds, the flight portion of the Air Show was restricted to a few passes by aerobatic sport aircraft and a pair of bright Red Smirnoff Vodka MiG-17s.

SANTA MARIA MUSEUM NEEDS HELP!

The Santa Maria Museum of Flight recently rescued an F-86F Sabre from China Lake Naval Air Station. The aircraft arrived in pieces and will be a major effort to restore it for display in the museum. Thousands of dollars will be required to accomplish this task. Since everything in the museum is done by donation of time, talent and **Treasure,** can you help? Please send your tax deductible donations to:

K. R. (Dick) Weber
Santa Maria Museum of Flight
3015 Airpark Drive.
Santa Maria, CA 93455-1821.

EDWARDS AFB OPEN HOUSE IN OCTOBER

The open house at Edwards Air Force Base this year will be held on October 20-21, 2001. The theme of the event will be the celebration of the Fiftieth Anniversary of the Air Force Flight Test Center. Although the program is still being organized, it is anticipated that General "Chuck" Yeager will be present to reenact his breaking of the sound barrier.

In reviewing all of the scientific and engineering feats that were accomplished at EAFB during these past 50 years, it is hard to imagine that ancient man once traversed this inhospitable site.

Archeological findings indicate that Native Americans inhabited the area on a seasonal basis as early as 20,000 years ago. The region was explored by the Spaniards in the 18th Century, and by Americans, namely John C. Fremont, in the early 19th Century. The first permanent settlements, however, came about with the expansion of railroads into the western Mojave during the 1870's.

The Southern Pacific Railroad was first in the region in 1876, when it extended a line from the San Joaquin Valley, over the Tehachapi Mountains, and through the Antelope Valley toward Los Angeles. In 1882, additional tracks, which would become a part of the Atchison, Topeka and Santa Fe network, were extended westward out of Barstow toward Mojave and crossed what is now Rogers Dry Lake on Edwards AFB.

In 1910, Clifford Corum established a homestead near the immense dry lake. To attract others, he built a combination general store and post office. His request to have the post office named "Corum" was disallowed by postal officials because a similar name was already in use elsewhere in California. So, he simply reversed the spelling of his name to "Muroc". It was a name that would become associated with flying and flight-testing for nearly 40 years.

The location was first used by the military in 1933 when a small detachment from March Field laid out some temporary bombing and gunnery ranges. By 1937, the entire Army Air Corps was conducting maneuvers there and a semi-permanent tent camp was established along the eastern shoreline of the lakebed.

Designated originally as the Muroc Bombing and Gunnery Range and later as the Muroc Army Airfield, the base played an important role in the training of fighter and bombing crews throughout WW II.

In 1942, a team from the Material Center at Wright Field in Dayton, Ohio came to Muroc to evaluate it as a potential site for a test program rivaling the Manhattan Project in secrecy! The suitability of the location was evident and the test program for the Bell XP-59A "Airacomet" was moved to a hastily constructed area at the north end of Muroc Dry Lake. On October 1, 1942, Bell test pilot Bob Stanley took the first jet aircraft up for its maiden flight and America's jet age began.

In the post-war years, the operations at both North and South bases were combined and the installations became a full-time flight test facility where aviation records became almost common place. The attempt to exceed the fabled "speed of sound" was accomplished on October 14, 1947 when Capt. Charles E. Yeager piloted the Bell X-1 to a speed of Mach 1.06.

The first stages to develop a rocket engine test site along Leuhman Ridge, above the shore east of Muroc Dry Lake, were begun. This site has since been transformed into Phillips Laboratory, where the technology for ballistic missiles and space motors is being developed.



Ceremonies were conducted on January 27, 1950 renaming the base in honor of Capt. Glen W. Edwards (above), an accomplished test pilot killed in the crash on June 5, 1948 of an experimental Northrop YB-49 "Flying Wing" bomber

The Air Force Flight Test Center was officially activated at Edwards AFB on June *25,* 1951; just four months after the Test Pilot School had been transferred to the base from Wright-Patterson AFB, Ohio. On January 1, 1979, the Hill and Wendover Ranges and part of the Dugway Proving Grounds in Utah were consolidated into the Utah Test and Training Range and placed under the management of the ALFFTC.

Over the years, Edwards has become synonymous with aeronautical achievement and famous as the site of many "firsts". It is where the nation's first jet- and rocket-powered flights took place. It is where men and machines first exceeded Mach 1, 2, 3, 4, 5 and 6, and where they first flew above 100,000, 200,000 and 300,000 feet. The famed North American Aviation X-1 5 rocket aircraft set altitude and speed marks of 354,200 feet and 4,520 mph that still stand for winged aircraft.

Silent Majority (continued from page 15)

WOO, KLIRY -- passed away the week of June 19, 2000. He worked in Autonetics Flight Control.
ZAIS, GUSTAVE "GUS", 78 -- of Springfield, OR passed away at home on March 13, 2001, of an aortic aneurysm. Gus worked for 37 years at North American/Rockwell in management at several divisions. His daughter, Susan LeRoy, notified us.

SILENT MAJORITY INFORMATION

When reporting an obit for the Silent Majority, please include the person's age and the date of his passing away. You may also include the cause of death, his position and his last place of work at NAA/Rockwell, if these facts are known.
Thank you



IN MEMORIAM

WALKER, DAVID M., 56 — A Former NASA and Captain USN, Ret., died on April 23, 2001 at the M. D. Anderson Cancer Center in Houston, TX. A graduate of the U.S. Naval Academy, he completed flight training and was designated a naval aviator. After duties aboard the carriers USS Enterprise and USS America he took further training to become a test pilot. He logged more than 7500 hours flying time and was selected by NASA in 1978 to become an astronaut. A veteran of four space flights David logged over 724 hours in space. He was the pilot aboard STS-51-A on DISCOVERY and mission commander for STS-30 on ATLANTIS, STS-53 on DISCOVERY and STS-69 on ENDEAVOR. He is best remembered for his many visits to Downey and other NAA/Rockwell facilities to present the highly prized Astronaut "SNOOPY" Awards to outstanding employees.

ALLEN, MAX, 87 -- passed away in Carlsbad, CA on April 7, 2001, after cancer surgery. Max started as an engineer in the Wing Group at LAD and later in Palmdale. His good friend, Gus Ruppert, notified us.
ANDREW, LOWELL VICTOR, 78 -- of Fullerton passed away April 21, 2001 of cancer. He worked as an aerospace engineer. Information from letter and obituary notice sent by William T. Schleich.
AUSTIN, VINCENT J. -- Torrance, CA, died April 5, 2001. He was a retired flight systems engineer for Rockwell. Information read in an obituary of the Daily Breeze.
BANGERT, EVELYN -- passed away the last week of May 2001. She was a North American/Rockwell retiree. Information received from Andy Tindley of Torrance, CA.
BELL, GEORGE, 69 -- of Buena Park, CA, died March 31, 2001, of cancer. He was a retired engineer for Rockwell International. Information obtained from an obituary in a local paper.
BERGDAHL, DAVID -- passed away June 20, 2000 after a history of heart problems. He was a propulsion and Fluid System expert on NAVAHO, X-15, Paraglider, Saturn and several limited access programs. He retired in 1989 after a 34-year career. A good friend, Merle Johnson, notified us.
BLANCHARD, LARRY, 80 -- of Calimesa, CA died May 1, 2001, of complications of bypass surgery. He was in Quality Control management at NAR. Information from an obituary sent in by Ken Fowler.
BOWER, JOHN L, SR., 86 — passed away May 20, 2001, in Santa Monica, CA, He worked at NAA from 1950 through 1958 in the development of numerical controls machining. Information obtained from an obituary in a local newspaper.
BRENT, FORREST -- of Manhattan Beach, CA, passed away December 26, 1999, after two years of Alzheimer's Disease. He retired in 1984, from Autonetics, after 38 years. His wife notified us.
BRODERICK, RAY - passed away August 4,2000. Notified by e-mail by Jim Sexton.
CARPER, GRACE L --Retiree News returned, marked "deceased"..
CRASSE, DANIEL EDMOND, 77 -- of Anaheim, CA, passed away March 27, 2001, due to congestive heart failure. He was an electrician for Rockwell International. Information obtained from an obituary in a local paper.
CHRISTIANSEN, MILT "CHRIS" -- passed away May 26, 2001. His wife, Jean, notified us.
CLARK, LARRY DEAN, 64 -- of Westminster, CA, a manager for Boeing Aircraft, died April 16, 2001, of cancer. Information obtained from an obituary in a local newspaper.
CLOTWORTHY, PHYLLIS COLLINS -- died at home on May 10, 2001, after a long battle with lung cancer. She was the wife of Lee Clotworthy. Information obtained from an obituary in a local newspaper sent in by Al Kustra.
CONSTANTINEAU, ALBERT ROBERT, 84 — of Hemet, CA, passed away May 17, 2001. He was an inspector for North American Aviation in El Segundo for 20 years. Information from an article in the Riverside Press- Enterprise sent to us by E. G. Logelin, Hemet, CA, Gene Somers, Idyllwild, CA and R F. Williams.
CROSS, LEONARD 5., 85 -- passed away March 13, 1999, from a cerebral hemorrhage. He started at NAA in 1947 and was in management in Purchase Labor. His wife, Evelyne, notified us.
DROBKA, ROBERT GUY — passed away March 29, 2001. He retired in 1990 after 37 years of service with Rockwell International at Los Angeles and Canoga Park. Information obtained from the Daily Breeze.
DUNBAR, KATHLEEN — wife of James Dunbar, passed away May 27, 2000, after several years of battling Alzheimer's disease. Jim Dunbar worked in the Engineering specifications group and retired in 1984.
ESSINGTON, LARRY D., 66 — died from a heart attack in Downey, CA on April 26, 2001. He was a material-scheduling manager when he retired in 1996, after 34 years of service on many projects, including Apollo, B-1, and Space Shuttle. A good friend, Ken Gallagher, notified us.
FREDENALL, VIOLA, 87 — passed away February 7, 2001. She worked in the Planning Department of North American Rockwell for over 10 years. Information obtained from an obituary notice in the Hemet News, sent to us by Robert F. Williams.
GAONA, ROBERT J., 70 - died May 23, 2001, at Duke University Hospital in Durham, NC. He retired in 1988 from Rocketdyne as a contract pricer after a 30-year career. He and his wife, Dorothy, moved to Raleigh, NC in 1995. Information obtained from an obituary notice in the newspaper.
GATES, CHARLIE, 87 -- died at his home in Tuttleton area in Sonora, CA. He was active in the California Sports Car Club and won six West Coast titles and one national title during his time racing. Charlie was a Field Service representative for NAA during WWII and the Korean War. Information from the Sonora, CA Newspaper sent in by Bernard (Bob) Barnes, NAA Field Service Publications.
GAZELLE, PATRICIA OLSON, 77 -- of Anaheim, CA, a retired planning clerk, passed away April 18, 2001, of a heart attack. Information obtained from an obituary in a local newspaper.
HALL, LYTLE L, 83 -- died March 3, 2001, from complications of angina. He retired in 1988, from Tool Design at LAD.
HARBERT, DONALD B., 85 --passed away May 29, 2001. He was aerospace engineer with North American Rockwell for 30 years. Information obtained from an obituary in a local paper.
HART, WILLIAM H. "BILL", 77 -- of Las Vegas, formerly of Yorba Linda, CA, a retired systems analyst for Rockwell International, died April 13, 2001, of Alzheimer's Disease. Information obtained from a local paper.
HAVER, CHARLES HENRY III, 69 -- of Fullerton, CA passed away July 18, 2000, of heart disease. He worked at Autonetics for many years in

Human Resources. Obituary submitted by Maxine Haun.
HUNSICKER, RUSSELL LOREN, 78 -- passed away at his home in Manhattan Beach, CA, on April 2,2001. He was employed with North American Aviation from 1952 to 1982, when he retired from the company. Information obtained from local newspaper.
HOUSTON, ELSIE JEAN, 79 -- of Seal Beach, CA, passed away June 5, 2001, of heart disease. She worked as a typist for Rockwell International. Information from Ed Rusinek, and an obituary sent by Maxine Haun.
KAMMEYER, HERBERT B., 73 -- of Fullerton, CA, a chemist for Rockwell International, died April 26, 2001, of heart disease. Information obtained from a local paper.
KRELL, HAROLD, 76 — passed away December 27, 2000, at a convalescent hospital in Hemet, CA. He worked as a technician for 33 years at Rockwell International in Anaheim. From an obituary notice in the Hemet News sent by Robert F. Williams.
LAFAYETTE, ROBERT M., 77 — died on April 11, 2001, in Hawthorne, CA. He retired as a planner in 1987. A good friend, Loren Johnson, notified us.
LEVINE, DON L — passed away January 20, 2001 of pancreatic cancer. Don was an engineer in the ECS group at Space Division for about 30 years, retiring in 1989. We were notified by his wife, Beverly (Sue), Cypress. CA.
LOMBABDI, FRED — passed away June 12, 2000. He worked in Warehousing at LAD for many years. Glenda Kelly and Rhoda Bosdet notified us.
LONG, RICHARD, 64 — of Hemet, CA, passed away at home of a heart attack February 3, 2001. He worked as a Purchasing Agent for Rockwell International for 29 years. Information obtained from an obituary notice in the Hemet News sent by Robert F. Williams.
LUNDE, RUDOLPH NORDLAND "RUDY", 83 — passed away April 4, 2001. He worked for Rockwell for 35 years as a tool and die maker. Information obtained from a local newspaper.
LUNDKVIST, BECKY-- passed away October 2000. Becky worked in Surplus Property at LAD. Glenda Kelly, who was informed by Becky's husband, Bennet, notified us.
LYNN, GEORGE WASHINGTON, 77 -- passed away April 7, 2001, at his home in Hemet, CA. He was a technician for 13 years at Rockwell International in Anaheim. Information from an article sent in by Gene Sommers.
MILLER, ROBERT AUGUST, 78 -- passed away peacefully on May 21, 2001, in his home in Vista, CA. He joined NAA as an engineer in 1950 and lived in the South Bay area until his retirement in 1986. Obtained from an obituary notice in a local newspaper.
MOORE, MILDRED V., 78 -- of DeSoto, Mo., formerly of Anaheim, CA, an accountant for Rockwell International and Hughes Aircraft, died June 4, 2001, of cancer. Information from an obituary sent in by Maxine Haun.
MOTLEY, DAVID, 71 -- Santa Ana, CA, was killed April 28,2001, piloting an experimental plane in the Mojave Desert. Information from an obituary in the Orange County Register sent in by Maxine Haun.
PELLAND, PHIL, 84 -- of Redondo Beach, passed away on April 6, 2001, due to heart failure. Phil was a design engineer and worked on the B-70, B-1 and the Space Shuttle at El Segundo and Downey. His good friend, Dan Shaefer, notified us.
REGAN, THOMAS L, 88 -- passed away May 10, 2001 at McAlester Regional Health Center, Oklahoma. Tom worked in various management positions for nearly 40 years at LAD, Fresno and Space Division and left to be Plant Manager at the McAlester Plant in 1963 until retirement in 1975. Gene sent in information and Ruby Hales, of Stuart, Oklahoma, who also sent us the obituary.
RONNINGEN, JOHN O. --passed away April 18, 2001. John was in management in Quality Control. He hired in at LAD in 1941, and retired from Space Division in 1979. Ron Bishop, Fountain Valley, CA, notified us.
ROSS, DONALD, 76 -- died of a heart attack on March 13, 2001, at Inland Valley Regional Medical Center in Wildomar, CA. He served in the US Army from 1943 until 1945 and received the Purple Heart. He retired from Rocketdyne after 31 years as an engineer. His friend, Bill Hurd, notified us.
SCHRIVER, JOHN R, 70 --passed away after a long bout with cancer on March 27, 2001 in Fullerton, CA. John started as an electronics engineer at Autonetics in Anaheim in October 1959 and retired in August 1992. His wife, Lois, informed us.
SCOTT, NEAL — of Aloha, OR, passed away April 3, 2001. He had suffered a massive stroke in February and was hospitalized until his death. He worked as an aeronautical engineer in Engineering Flight Test at LAD, and also spent time at Edwards Air Force Base and China Lake. Information sent to us by Jean E. Ronif, Engineering Flight Test at LAD.
SHERMAN, LYLE, 86 -- long-time resident of Fallbrook, CA, died in Spring Valley, CA, April 9, 2001. Lyle was an aeronautical engineer for 33 years, working on such projects as Apollo, Saturn and B-l Bomber. Howie Burhop, Fallbrook, CA, notified us.
SHORT, RAY, 85 --passed away March 27, 2001, of a heart attack. He worked as a dispatcher at Rockwell International in El Segundo for 30 years and retired in 1977, then moved to Hemet, CA. Information in an obituary notice in the Hemet News sent in by Robert F. Williams.
SHULER, THOMAS K "TK", 76 --passed away on April 9, 2001, in Moraga, CA. He was a Silver Eagle contributor to the Retirees Bulletin. TK started at NAA in 1951 as an engineer in the Flight Control Section of the Aerophysics Lab. He transferred to Autonetics where he held several management positions including VP and General Manager of the Minuteman Division. He retired in 1986 and had been in poor health for the last two years. Maxine Haun, and a good friend, Bob Nease, notified us.
SIEGEL, SIDNEY, 89 --died March 16, 2001, of cancer, at his home in Pacific Palisades. He was a charter member and former president of the American Nuclear Society and from 1950 to 1972 he was vice-president and national director to Los Angeles based Atomics International. Information from an obituary sent in by George Wiley, Manhattan Beach, CA.
SMITH, JAMES PAUL--passed away in May, 2001. He was a Systems Engineer for Rockwell International Engineering in Anaheim, CA for 20 years. Information sent by Sonnie Robertson and Maxine Preston obtained from an obituary in the Riverside Press Enterprise.
STANLEY, JOEL G., 80 -- passed away April 16,2001, in Lavaca, AK. He retired from North American Rockwell in 1983. Information obtained from an obituary in a local newspaper.
STANTON, CURTIS, 86 -- of Garden Grove, CA, passed away on April 3, 2001, from the complications of a series of strokes in the last three years. Curtis hired in at LAD in 1947 and transferred to the Space Division in Downey. He also worked at the plant in Kansas City. He retired from Seal Beach in 1980. Danny Lopez notified us.
STEVENS, CLAYTON L, 80 -- of Brea, CA, died on April 17, 2001. He retired as an engineer from Space Division after more than 23 years on the Apollo and Space Shuffle programs. From an obituary and letter provided by William T. Schleich from Fullerton, and Maxine Haun.
STUART, JAMES C., 80 -- of Laguna Woods, CA, passed away April 24, 2001, of lung cancer. Obtained from an obituary in a local paper.
UNDERHILL, FRED, 79 -- passed away July 13, 2000, of pulmonary problems. He worked from 1939 to 1980 on engineering flight test projects both at Los Angeles and Palmdale, and retired from Space Division, Downey, on the Shuttle Program. His wife, Barbara, notified us.
WILLIS, WILLIAM E., 80 -- of Atascadero, CA, passed away on May 8, 2001. He retired from Rockwell International after 28 years and then spent 20 years as a gunsmith. Information from a San Luis Obispo County Gazette obituary sent in by Arnold E. Hermansen, Atascadero.
WILSON, MEL --passed away on March 3, 2001, from cancer after extensive radiation and chemotherapy treatment. His good friend, Don Wegner, notified us.
WINSLOW, DORIS M., 95 -- died quietly in her sleep in Orange, CA. Doris worked in Blueprints Control. Information obtained from an obituary in the Irvine World News.
WITTER, DON - passed away February 10, 2000. He worked as a field service instructor in various locations on aircraft being built by NAA, including the B-70, as well as missile programs (Saturn & Apollo) We were notified by Leon McGinnis.

Silent Majority Continued on page 13

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Bob Crockett attended the Rally of the Warbirds at Bishop and provided the photos seen here. He noted that the trainer above is a T-28B built in Downey in 1953/54, the other 14 on the right are T-28C built for the Navy.
Our sincere thanks to Bob Crockett

T-28 "WARBIRDS" FLEW INTO BISHOP

On Friday, May 18, 15 NAA T-28 trainers and other vintage aircraft flew into the Bishop Airport in California. After visiting with the public, a special dinner was prepared by the Bishop Airport Café. The pilots spent the night there and departed for Nevada the following day

Other photos in this issue are courtesy of the AFFTC History Section

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION

Retirees Bulletin

FALL 2001

Inside:

TO MACH 2 OR NOT TO MOCK 2 by John Moore
HOW THE BEST WAS WON by Bastian (Buz) Hello
FROM AIRPLANES TO AIR BREATHERS by Dale Myers
NOTHING BUT THE FACTS, PLEASE by Sam Iacobellis
DUTCH KINDELBERGER'S MIRACLE MAKERS in Centerfold



TEST PILOT JOHN MOORE BOARDING A VIGILANTE RA-5C IN 1961

NORTH AMERICAN AVIATION
Retirees Bulletin

DEAR NAA RETIREE BULLETIN SUBSCRIBERS

Our Spring Issue went out First Class Mail and everyone received his copy within a few days so that is the approach we will use in the future. Many of you have written in and told us that you are enjoying our new format with more stories about our North American Aviation people and products. We also got another scorching phone call from the lady that reported the death of Donna Lewis. It appears that Donna was not a secretary but a member of upper management. Mea Culpa! We apologize to Donna and the lady reporting her passing.

We have invited several retirees to enrich our publication with stories from their personal experiences. One of these hands-on historians is Cdr. John Moore, USN Ret. He was a Navy combat pilot, a Navy and *NAA* test pilot at our Columbus facility, and, finally, Apollo Test Operations Manager at KSC. Unfortunately, John has a serious health problem and is undergoing difficult treatment. He cannot write but he did give us permission to extract stories from his book THE WRONG STUFF. The first of these appears in this issue.

Others that answered our call for hands-on-historians include Bastian (Buz) Hello discussing the actions taken to restart the B-1B after President Carter cancelled the program. Coincidentally, the Los Angeles Times recently printed an editorial indicating the B-1B has outlived it's usefulness. Sam Iacobellis responded with a rebuttal, which the Times did not choose to print so we have taken up the gauntlet and we are printing Sam's response. Finally, Dale Myers discusses the first twenty years of his career, which started with the P-51 airplane and went on to the air breathing vehicles.

We are grateful to these fine authors for their splendid recollections and for the "contrails" provided by Mac McMurran, George Patterson and Dick Morley. We also have another centerfold from RoIf Schmued. Each of these reflections tell the story about a very unique group of people that composed a company called North American Aviation, Inc. Perhaps they were unique because they loved what they were doing. As a result, it was a company that had no boundaries on imagination and no limitation on accomplishment.

Many of you complained that you do not know when your subscription expires. Sonnie Robertson now includes your expiration date with your address label on page 16. Those of you that sent in $10.00 will expire after the Winter 2001 Issue. This also holds true for those that gave gift subscriptions. These will also come due after the Winter 2001 Issue.

Again we are saddened by news of the passing of yet another NAA Legend. On June 29, 2001 Walt Spivak went peacefully in his sleep at his home in Pearblossom, California. Walt's career extended 48 years and touched on virtually every airplane produced by NAA/Rockwell. More in the Silent Majority.

Although we seem to be making little headway in gaining new subscribers, we now have among our lifetime subscribers one "Golden Eagle" ($500) and 231 "Silver Eagles" ($100) readers. To all of our subscribers we say Thank You and God Bless.

NAAR is an affiliate of the **Bald Eagles, Inc.** and is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAAR office is located at Boeing, Seal Beach facility. Send mail to:
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Technical Advisors	Mike Davis John Flavin, John Markel Ken Fowler Howard Axtell Robert Nease Joe Onesty

MEMBERSHIP FORM

Yes, I am a retiree of NAA/Rockwell and I want to be a member and receive the NAA Retirees Bulletin. I am enclosing a check payable to the Bald Eagles, Inc. for $ _____
For every $10.00, I will receive four issues.

Name _____
Street Address _____
City/State/Zip _____

I retired from_____ Division
After _____ Years of Service

You may also send a gift subscription to another NAA retiree. Just give us the name and address of the recipient along with your payment and we will send a gift card to him

MOVING? ON EXTENDED VACATION?

If you are moving or you are "Snowbirds" taking an extended vacation at another location, please let us know your new address as soon as possible.
We receive several dozen returns with each issue indicating the subscriber has moved — sometimes with a new address on a yellow label and sometimes with the rather somber "Address Unknown". It is not clear whether the recipient has joined the "Silent Majority" or is out there somewhere?
For you "Snowbirds" — Your Bulletin is returned to us stamped with "Temporarily Away" with no indication when you will return. So please give us your new address as soon as possible and send the information to:

NAA Retirees Bulletin
2600 Westminster Blvd
PO Box 3644, M/C SJ51
Seal Beach, CA 90740

NAA/ ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Bill Kelley at (714) 637-9374
The Antelope Valley Retiree Club meets temporarily in Courson Park at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell retirees are welcome. For information call Bill "Tiny" Kisler at (661) 273-0213.
Boeing Valley Retirees Club meets on the 3rd Thursday of each month at the Canoga Park Rec. Center. 8500 Fallbrook Ave. Canoga Park, CA. President: Jennie Muncaster, dial (818) 341-8919
Autonetics Retirees meets for lunch at 11:45 AM on the 2nd Wednesday of each month at the Rembrandt Restaurant, 909 E. Yorba Linda Blvd.. Placentia CA. All Autonetics retirees, spouses and friends are invited. .
"Ye Olde Pharts Breakfast Club" now meets for breakfast at Polly's Pies at 2025 N. Tustin Ave in Orange on the 4th Thursday of each month at 10 AM . For information, call Don Metzger at (949) 495-5374
A group of NAA Retirees meets for breakfast on the 1st Wednesday of each month at the Knott's Berry Chicken Farm Restaurant at 8:15 AM. All are invited.
A group of Retirees from Seal Beach meets at 11:30 AM at "The Fish Co", Los Alamitos and Katella, on the 3rd Wednesday of each month. For more information, call Marvin Blaski at (714) 848-5717 or e-mail: mblaski@aol.com
"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meets for lunch on the 2nd Wednesday at 11:30 AM at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd and Mariposa Ave.
"The Old LAD Stress Group" meets approximately every two months at Mimi's Café in Torrance, CA for breakfast. If you were in the old LAD Stress Group and want to join them, contact Gene Laxton (310) 378-3113 or Ed Rosenthal at (310) 375-8933
The Downey Engineering Group of Retirees known as "The Choir Boys" meets every Thursday for lunch at various restaurants from Seal Beach to Downey. Call Al Risi at (714) 892-5725 for meeting location.
GPS Breakfast Club meets every Wednesday morning from 6:00 to 8:00 AM at the Primrose Restaurant at the corner of Seal Beach Blvd and Westminster Blvd. All are invited, retired or not. For information call Fred Shitara at (714) 750-1016
The Facilities, Industrial Engineering and Plant Services Retiree Group meets on the 2nd Thursday each month at the Jolly Roger in the Long Beach Marina at 11:45 AM. Friends and wives, former and current employees are welcome.
The North American Rockwell Retirees Club of McAlester Oklahoma (a satellite of Tulsa, OK) meets each month on the 3rd Tuesday, 10:30 AM at the Down Town Meeting Place. For more Information contact:
J. A. Darden, 343 W. Adams Ave. McAlester, OK 74501 or phone (918) 423-0706.
Tulsa & McAlester Retirees meet for breakfast at 8 AM on the 2nd monday of March, June, September and December at the Ramada Inn, 8181 East Skelly Drive in Tulsa. Call Harry Phillips for more detail at (918) 838-3716.
The North American Rockwell Retiree Group of Columbus, OH. Engineers and Professionals meet each month on the 3rd Thursday at 11:30 AM at the Berwick Park House. For more info. contact Byron C. Solomides at (614) 486-3239.
NAA/Rockwell U.A.W. Group of Columbus, OH, meets on the 1st Monday of each month at Noon at the Old Rockwell Park (North Hamilton Rd.) E. Hamilton at (740) 927-5940.
Autonetics Group that includes Marine Systems, Program Office, Project Office, System Test, Engineers, Designers, etc. meets for lunch on the last Wednesday of each month at the HomeTown Buffet, Rose Avenue and Alta Vista Drive in Placentia. For more information call Mike Vohs at (714) 762-1925.
A group of NAA Retirees from 101 Tooling meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at the Cimarron Café at 5160 190th St., West of Anza Avenue in Torrance.
Autonetics Finance Luncheon. This group meets for lunch the last Wednesday of the month at Carrow's located at 100 N. State College in Fullerton. Anyone interested can call Ken Cantwell, at (714) 970-7171 or send e-mail at: kcantrell@prodigy.net, to obtain more information.
Autonetics Industrial Engineering and Maintenance Retirees meet for lunch the 1st Thursday of each month at the HomeTown Buffet, 390 McKinley, located in front of Home Depot, in Corona. For more information call Don Burt at (909) 698-0072
NAA Tech Reps Assn. (TRA) Breakfast Club meets the 1st Tuesday of each month at the Carlsbad Airport Restaurant at 9:00 AM.
For more information call: El Presidente, Rafael Colunga at (760) 940-0525
A Group of Engineers Mgt. , meets on the 3rd Tuesday monthly at Denny's on Imperial Hwy and 57 Fwy. at 11:30 AM for lunch. For more information call Ed Moran at (562) 697-9949
Autonetics Flight Control Retirees meet on the 3rd Thursday of every month, except December, at 11:30 AM at "The Lamppost Pizza House" located at 17568 Yorba Linda Blvd. corner of Richfield Road in Yorba Linda. Call Jim Anderson at (714) 779-5620 for more information.

ANNUAL EVENTS

The "Warbird Round-Up", sponsored by the Santa Maria Museum of Flight - September 14th - 15th, 2001 at the Santa Maria Airport
Bald Eagles Reunion - The 40th Annual Reunion is on April 13, 2002, call Val Yarbrough at (805) 646-2283
Grants Pass Picnic - 1st Wednesday after Labor Day, September 4, 2002
NAA-K B-25 Reunion. For more information call Harry J. Desko (913) 287-7223 or write to him at 3024 N. 47th St., Kansas City, KS 66104.
Flying Horsemen For year 2001, information regarding events and reunions may be obtained from the troop secretary, Harold Shapiro at (714) 993-3496, FAX (714) 993-1208, e-mail shapsplace@aol.com or mail to 17822 Kennon Dr., Yorba Linda 92886-3919
The Hangar Gang - This group of retirees meets approximately every 6 months. For time and date or additional information call Gene Salvay (818) 788-3974, or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.
Annual Flight Test Instrumentation Reunion - This group of retirees meet annually at the Fullerton Elks Club. For Information call Ed Mosbrook at (714) 531-8060 or Frank Vigil at (562) 691-0236.
Tech Rep Association—a group of retired Field Service Technical Representatives has a yearly picnic in June at the park in Fallbrook. For more information, contact the TRA President Rafael Colunga, 5705 Redondo Dr., Bonsall, CA 92003 or at his e-mail address: rafael@nctimes.net
The Annual M&P, P.D.L., "Friends Christmas Luncheon". This group of retirees (and some still employed) have assembled in mid-December for a festive luncheon and gab-fest for the past 18 years. The last two luncheon were at South Bay Grill and Luig's.
Those wishing to receive notice of next December Luncheon, please call Fred Koeller at (310) 545-8854.
2001 Group Reunion Luncheon for TRI-STATE Members - This group will meet on Wednesday, October 17, 2001 at 11:00 AM to 3:00 PM (PST) at the Lancaster Elks Lodge #1625, 240 East Avenue K. Lancaster, CA 93534. For reservation call one of the committee member : Bill Bright at (661) 943-7276 or Steve Carlson at (661) 944-9698 or Jim Beall at (661) 945-1326
E-mail: bbright@hughes.net E-mail: Stvnvee@msn.com E-mail: jjbell@as.net
Saturn S-II Reunion - will be held on May 18,, 2002 at the Grand Hotel in Long Beach, CA. Those interested in paticipating or attending should contact Al Otto at (714) 775-4721 or e-mail him at gypsyma@aol.com.

The Editor's Corner

Documentary about the F-86 Sabre for the History Channel.

As part of a series called "BATTLE STATIONS", FlashBack Television in London is making a documentary about the F-86 Sabre Jet for the History Channel. They will be looking at the history and development of the Sabre design and its first combat use in Korea.

They would very much like to contact former employees of North American Aviation who were working there at the time of the design and production of the F-86 Sabre. They would like to talk to anyone who was in or connected with the design team.

It would be most helpful if you could help FlashBack TV Limited.. Contact :

Katie Chadney
FlashBack Television Limited
11 Bowling Green Lane
London, EC1R OBD.

FlashBack TV has made two previous series of Battle Stations for the History Channel and they would be happy to send you more details of FlashBack's plans for the Sabre documentary.

You can find out about the company by visiting their website at:
www.flashbacktv.com

E-mail: mailbox@flashbacktv.co.uk

Miscellaneous Information

All NAA / Rockwell / Boeing Retirees that have a need to contact the BNA Benefits Center must have their Personal Identification Number (PIN) available before attempting a call to the Center.

The telephone Number is 1-800-438-3116. The business hours are from 10 AM to 6 PM (EST) M through F.

If you don't have one or forgot your PIN, you must write to the Center:

BNA BENEFITS CENTER
PO Box 24567
Jacksonville, FL 32241-4567.

Services provided by the Center are:

Life events, enrollment or change in medical/dental plans, address changes, plan comparisons of medical benefits, answers to general health/dental/vision and life questions, health care/Life Insurance direct billing procedures and confirmation statements.

The above information does not apply to retirees from the Rockwell Corporate Offices. These former employees remain under the Rockwell Corporation benefits and pension plans

Other Services Available to Retirees

The Boeing California Employee Fitness, Inc. location at Seal Beach is available only to Retirees. To access the facility, retirees must exchange their Retiree Card for a temporary "Retiree" badge at the Gate 510 Security window on Westminster Blvd.

However, the fitness centers at Anaheim and Huntington Beach are now open to retirees and their dependants On your first visit, stop at the office and fill out a short form and receive a dependant card.

Discount tickets to recreation parks are no longer available at the Fitness Center. However, there is another source available. For Employee Services discount tickets:

www.Boeing.esvp.com/, if you have internet, if not: call 1-877-641-7283

Retirees on tours wishing to rent a car can benefit from the Boeing Corporate Discount.. The company negotiated contract agreements are: No. 5555501 for National and No. 147616 for Alamo.

Refer to the pertinent number when negotiating a rate for car rental at National or Alamo. Have your retiree ID card with you all the time

WE ARE CONCERNED!

We include the SILENT MAJORITY in our publication as a final salute to those of you that have been called to the other side. What concerns us is the number of you that are taking that final journey so soon! Our list runs over two pages every three months. To stem the tide, we have come up with a list of Do's and Don'ts to keep you with us as long as possible.

- Don't allow yourself to lose your temper. Anger is non-productive and only raises your blood pressure.
- Take your medication diligently as prescribed by your doctor.
- If you are diabetic, check your numbers often and try to stay within safe limits.
- Don't cosign any loans and don't lend anyone any money —especially to your "kids".
- If you must transact money — borrow some and let the other guy worry about getting it back.
- If you are overweight, eat less and lose some pounds. Remember, the gates of Heaven are very narrow!
- Reduce your intake of meats and fats. Replace them with grains, vegetables and fruit.
- Have a glass of a quality red wine with your supper — Don't touch any white wines-that stuff will kill you!
- After supper, don't plunk in front of the TV for the rest of the evening. Instead, take a ½ hour walk.
- Try to extend that walk everyday until you reach an hour.
- If your "Soul Mate" is dead and you feel "lost" — stop moping and get active — you will join your loved one soon enough.
- When someone asks, "How are you"? Say you are "SPLENDID" even if you are not. You will be rewarded with a smile.
- If you are faced with a heavy burden, visit your church or temple and ask God for help.
- Prayers are never wasted — if you feel more prayers are needed, drop us a note and we will add you to ours.

If you feel that you have just been scolded, it's because we want you around for a long time. You are family and we love you!

The Staff of the NAAR Bulletin

TO MACH 2 OR NOT TO MOCK 2

BY CDR. JOHN MOORE, USN RET.

World famous aviatrix Jacqueline Cochran arrived in Columbus for a scheduled ride on the Vigilante, which had been arranged by the high muck-a-mucks in Washington. The objective, besides good public relations, was to get her to Mach 2 for the first time.

Jackie had flown past Mach 1 in a North American's F-100 Super Sabre jet both as pilot of the machine and as a passenger in the two-seated version. Now it was on to Mach 2, she hoped. She was a great gal, strong willed and exceptionally knowledgeable in aviation matters, which came as no surprise to us test pilots at NAA who were pleased to associate with her in this venture. Her dominating personality deployed a wry sense of humor at all altitudes as I soon discovered.

We checked Jackie out in the rear seat of the A3J-1 Vigi. There were no flight controls in that cockpit, but she really did not care on this mission. She just wanted to achieve Mach 2. With the wisdom of a woman who held many aviation records, she carefully reviewed and digested cockpit matters related to safety - the ejection system, radios and the like. But she was impatient and wanted to get on with it.



An A3J-1 Vigilante

I was the lucky lad assigned to take this distinguished lady on her historic mission. The day was clear but the temperatures at altitude were unusually warm, which caused me some concern. At 35,000 feet, the temperature norm is minus 65 F degrees, but on this day, the weatherman gave us a minus 56 F degree reading, which would be marginal for attaining Mach 2. Our performance guys said it might be close, but I should make that speed okay with my precious cargo in the back seat. So off we went.

Our FAA assigned supersonic corridor stretched from Knoxville, Tennessee, to Columbus, Ohio, with the provision that we be subsonic over both cities. But for this mission I decided to get a head start on my northward run, and thus started over Gatlinburg, Tennessee, at 40,000 feet — and was at Mach 1.2 by the time we reached Knoxville. Sorry, down there! Jackie asked some good questions as we motored northward and seemed delighted with the trip.

About Mach 1.6, our acceleration rate became noticeably slower as the "Vigi" engines struggled with the warmer air. At Mach 1.9, we were accelerating very slowly and I was running out of fuel and supersonic corridor at the same time. The Vigi stopped accelerating at Mach 1.96, as Columbus loomed close ahead. But I knew exactly what to do. I pushed the intercom button and said with pride, "Jackie, here we are at Mach 2." There was a moment's silence, then she replied, "Buster, you may be at Mach 2 in the front cockpit but I am only at Mach 1.96 in this cockpit."

Rats! I had forgotten that she had a Mach meter on the instrument panel in her cockpit. So it was out of afterburner and we returned to Columbus with the mission not accomplished. Jackie was pretty cute about telling our brass how much faster the front cockpit was than the rear one. She elected to stay another day to try it again with more optimum temperatures projected along with a faster pilot. So our boss, Jim Pearce, saved the day by taking his elegant passenger to Mach 2.01 in both cockpits of the Vigilante at the same time.

*Excerpted from **THE WRONG STUFF***
By permission of the author

THE WRONG STUFF

FLYING ON THE EDGE OF DISASTER

By Cdr. John Moore, USN Ret.

The first chapter sets the tone for the rest of the book!. John Moore and his squadron mates are eating Sunday dinner in the wardroom of the USS Essex in Korean waters when an order comes down to clear the aft flight deck of parked aircraft because a crippled Banshee is coming in under emergency conditions. John taxis the last plane forward to a designated parking spot on the very edge of the flight deck and can look down seventy feet to the water below.

The Banshee touches down at more than 130 knots and its hook fails to engage an arresting cable. The plane bounces up and over the crash barrier and is now bearing straight for John's airplane!!

I won't spoil it by giving you the outcome but let me say, I started reading the book after supper and I couldn't put it down until I finished it at 2:00 AM. It is almost as if you are seeing everything in ***fast*** *motion* through John's eyes.

He joins the US Navy during WW II but the war ends just as he completes pilot training. He switches to jets and is sent into combat during the Korean War. He, subsequently, becomes a US Navy test pilot. It is almost a natural that he next becomes a North American Aviation test pilot and then Chief of the Flight Test Project Group at the Columbus plant.

At forty, he climbs out of the cockpit and becomes the Apollo Test Operations Manager at KSC. The Apollo I fire brings his career with NAA to an end! He becomes the mayor of Cocoa Beach and currently resides there.

An endorsement on the book jacket probably describes this book the best. It says:

> "I flew with John Moore for many years, and I don't know how I survived it; I don't even know how he survived it! He has a great sense of humor. Readers will thoroughly enjoy his book. I may even buy it."
>
> Admiral Tom Hayward, USN Ret.
> Former Chief of Naval Operations

*John Moore is the epitome of the pilot that never volunteers but is always volunteered. He has flown over 104 aircraft types. He has watched his friends and colleagues die in combat and in test but this has never deterred him from taking his "turn in the barrel". The book is titled **THE WRONG STUFF** but the author has demonstrated that he has plenty of **THE RIGHT STUFF!** The book is an inspiration, especially for young people, and is still available from Amazon.com, Barnes and Noble or any well stocked book store.*

A Book Review by Ed Rusinek

FROM AIRPLANES TO AIR BREATHERS

BY DALE MYERS

I started working at North American Aviation in June 1943, after having flunked the eye test for the Navy. Aeronautical engineers were being deferred whether they liked it or not, because the aircraft industry desperately needed engineers. Larry Green and I started the same day at LAD. We worked for a wonderful guy named Ed Horkey and a great Deputy Chief Aerodynamicist named Harrison "Stormy" Storms. The company was turning out Mustangs at about 25 per day, at a price of less than $20,000 (not including Government Furnished Equipment, engines, guns and radios). Everyone was working their tails off for the war effort and getting a great deal of satisfaction over the results.

My first assignment was to choose the shape of the dorsal fin for the P-51D. What an opportunity! Working with Ed Horkey, we also examined why the Mustang automatically pulled out of a high-speed dive when the P-47 and other fighters tended to "tuck under" and crash. It turned out that the Mustang had fabric covered elevators, and in a supercritical dive, where shock waves were forming, the elevators bulged and changed their hinge moments in a way that deflected the trailing edge of the elevator up, pulling the airplane out of the dive. That was an incredible serendipitous fortune of design. Through no ingenuity on the part of the designer, many lives were saved!

With the end of the war, we started working on our first Navy jet, the FJ-1. About this time, we received (from Boeing, incidentally) a batch of microfilm which had been found at the bottom of a well in Germany. It turned out to contain technical reports on just about every new technology that Germany had developed during World War II. Larry Green and I started to read them at night (three hours a night, three nights a week) for about a year. With my one year of high school German, neither of us was very proficient in German but we sure could read technical German after those long nights.

We were completely stunned by what the Germans had accomplished. Not only swept back and swept forward wings, but ground-to-air missiles, the V-1 and V-2 ground-to-ground missiles, rocket powered aircraft interceptors, axial flow turbojets, and on and on. At the time, Larry was the project aerodynamicist on the F-86, a straight wing fighter with about 2/3 of the design complete. He went up the line and got Kindelberger to propose to the Air Force that we sweep the wing. The Air Force already had a straight wing aircraft in the Republic Aviation F-84. The Air Force gave the go-ahead. Larry did a superb job of designing the wing, it's slats and the integration of the fuselage and wing. It turned out that in a shallow dive, the F-86 would go supersonic, and as many suspect, may have gone supersonic with George "Wheaties" Welch before the X-1 did. We never tried to get the Navy to sweep the wings of the FJ-1, because jet engines were so underpowered at the time that we in the Aerodynamics and Propulsion Sections felt it would be a loser for carrier operations. Of course, when engines became more powerful, the FJ-2 swept wing versions of the F-86 came into the Navy.

Sometime in late 1945, Dutch and Lee decided the company should diversify and set up the Aerophysics and Atomic Energy Laboratories in the Tooling Building across the street from Mines Field. By 1948, the group had outgrown the building and was moved to the empty Vultee facility in Downey, California. Subsequently, further diversity and growth spawned Rocketdyne, Autonetics, Atomics International and the Missile Division. The Missile Division received a contract to build a vehicle to fly 1000 miles with a BIG warhead at supersonic speeds, and they were off to the races!

Larry Waite suggested that I might find more interesting aerodynamic challenges in Downey and he was sure right. I became totally immersed in supersonic flight, with emphasis on stability and control. Because we had decided that ramjets were the way to go, and that recovery after each flight test was by landing, we had to be stable throughout the entire range from Mach 3 to landing.

The NAVAHO Program brought forth rocket engines that were later used for all our earlier ballistic missiles navigation systems that went under the ice cap to the North Pole. Subsequently, they were used in ballistic missiles, supersonic aerodynamic configurations employing canards, the parallel booster configuration, and the use of titanium sheet metal for high temperature flight.

We flew the X-10 at Mach 1.84 in 1954 and the NAVAHO G-26 at Mach 3 for 1000 miles in 1958. Requirements changed almost every year, and ended up requiring a range of 6000 nautical miles with the same large warhead. The NAVAHO program was cancelled because warheads got smaller, re-entry heat shields got practical, and we improved inertial navigation to where ballistic missiles could be accurate and, therefore, more feasible. Nevertheless, NAVAHO was a treasure throve of technologies that first fed ballistic missile development and, subsequently, aircraft and launch vehicle design technologies. Everyone that worked on that program should be proud.

When NAVAHO was cancelled, we were in the middle of a proposal for an air launched cruise missile for the B-52, called the GAM-77 Hounddog. NAA won the contract, but, only, after the Missile Division had cut back from 10,000 to 1500 people as a result of the NAVAHO cancellation. Fortunately, the 1500 did a terrific job on the program! Names like Martin Boe, Sandy Falbaum and Jim Cunningham come to mind. That program started in 1957, and shortly after Sputnik, the Air Force asked us to accelerate the program schedule dramatically and become operational in 29 months! We took on the challenge and met it.

We had a big sign up on the wall that Irv Altneu suggested that read "Keep It Simple, Stupid". The "KISS" program paid off. For example, Air Force, Boeing and our cockpit display people were locked up in a room until they all agreed on the location and function of the missile control panel mounted in the B-52. That saved months in design. The GAM-77 (later designated the AGM-28) flew without afterburners at Mach 2.4 (today, that's called a supercruiser) for 700 miles and at Mach 0.9 on the deck.

At 20 per month, we produced 500 in a very short time and they were operational until 1975, longer than any other air launched cruise missile since that time. By the way, working with Boeing on that program was a delight. We made a special arrangement with the Air Force to reassign the Pylon design from NAA responsibility to a Boeing responsibility with Boeing subcontracting the Pylon to us. It made integration very simple.

As you may sense, the first twenty years of my career through the Hounddog was a very gratifying time. In a future issue, I shall describe some of my experiences with Apollo and the Aircraft Division.

About the author: Dale Myers started at LAD as an aerodynamicist assigned to the P-51, P-82 and FJ-1. He transferred to the Missile Division where he rose to VP and Program Manager for the GAM- 77 and Apollo programs. From 1970 to 1974, he was the NASA Associate Administrator for Manned Space Flight. In 1974, he returned to NAA/ Rockwell as President of the North American Aircraft Group.



Dale Myers
Former President of the North American Aircraft Group

HOW THE BEST WAS WON By BASTIAN (BUZ) HELLO

The B-1 program started officially on 6 June 1970 when North American Aviation Rockwell was selected to lead the development as the prime contractor.

After much discussion, the original requirement calling for five development airplanes was reduced in January 1971 to three. However, test articles such as mockups, landing gear test stands, swing-wing mechanism test set-up, and wind tunnel models were to be provided and test to be conducted.

To provide greater management emphasis, the Air Force and North American Rockwell concurred to create a B-1 Division out of the venerable Los Angeles Division. Subsequently, a fourth test airplane was added and, still later, authorization was received to purchase long lead materials and parts for what was intended to be the first two production airplanes, Airplane #5 and Airplane #6.

Following the election of President Jimmy Carter, the future of the B-1 became clouded. After much uncertainty, the White House and the Pentagon ordered on 30 January 1977 the cancellation of the production phase of the program. Simultaneously and significantly, the research and development phase of the program was allowed to continue. This included completion and testing of the first three airplanes, the test articles and the continued completion of Airplane # 4.

The published reason for these severe changes was the theory that the B-1 would be vulnerable to the Soviet Union defenses and that long-range cruise missiles would be more effective. As we learned, subsequently, another reason for the cancellation was the highly classified development of the B-2.

A strong effort was mounted to allow the completion of Airplanes #5 and # 6. While it was hoped to save these vehicles, the fundamental purpose of this effort was to assure protection of the research and development program. Continuation of R&D meant that a critical core team of engineering, material, manufacturing and test people could be held together! Without this team a program production restart would have been impossible.

Eventually, with the completion of Airplane # 4, even the core team was threatened. Other supplementary means of support became essential.

Three parallels and mutually supporting major efforts were then implemented.

- A GO-PLAN
- Outside support work
- An intense lobbying campaign

The GO-PLAN involved complete documentation of all the steps necessary for the rapid and comprehensive restart of B-1 production. When and if production was restarted, there could be absolutely no room for mistakes or fumbling! Restart had to proceed efficiently and smoothly so there would be no reason for a second production termination.

Outside support work needed to keep the core team together, was approached by having each department head, i.e. Engineering, Manufacturing, Material, etc. vigorously solicit subcontract work. The outcome included:

➢ Engineering, headed by Chief Engineer Hal Raiklen, "rented" an engineering team to Boeing to help with the design of on-going commercial aircraft programs. Another agreement was reached with Lockheed to help engineer their entry in the B-2 competition.

➢ Material, headed by Ernie Center, acquired a series of all-important subcontracts to provide detail pieces needed by Boeing for the manufacture of their new commercial aircraft.

➢ Testing, headed by Buck Buchanan, went to extraordinary lengths in providing support including the testing of masonry structures.

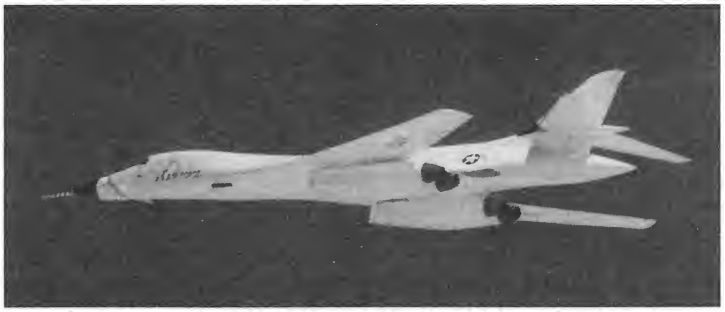
➢ All of this activity was carefully monitored, recorded and reported by the Finance Department, so ably headed by Doc Blalock.

The lobbying effort, headed by Johnny Rane, included contacting officials at every level of government. This concerted interaction was intense and unrelenting from production termination until production restart. It was remarkable in that it encompassed all levels and activities from Rockwell Chairman Bob Anderson and President Don Beall through the executives, supervisors and employees, not only at Rockwell, but also at the subcontractors and suppliers.

All of the anxiety and action was finally rewarded when, on 2 October 1981, President Reagan announced the go-ahead for one hundred B-1Bs.

About the author:

Bastian (Buz) Hello began his aerospace career with the Martin Company where he held key positions in several manned aircraft and space programs. He joined the Rockwell Space Division as the Division vice president and general manager of Launch Operations at KSC on the Apollo Program. With the Space Shuttle Program, Buz served as the division vice president and program manager of Space Division in Downey, CA. He subsequently moved to the Los Angeles Division where he served as president of North American Aircraft Operations in charge of the production effort on the B-1B. In 1997, he was made president of the Aircraft Group which included NAAO, Tulsa Division, Sabreliner Division and the General Aviation Division. He has received two NASA public awards and is a Fellow of the AIAA.



NORTH AMERICAN AVIATION, INC. FACTORY SUPERVISORS



STARTING TOP ROW, LEFT TO RIGHT

Row # 1 DICK SIEFRIED, GEORGE CONKLEY, RUDY KARST, WILLIE BISCHOFF, WILLIAM ARNOLD, CARL WALTERHOEFER, GENE KELLY, FRANK EMICK, GEORGE EBERLE, TOOTS ALMOND, FRED PRICE, EARL GARDNER, NORRIS CHASE, FRED YANSCH, JIM PORTER, WALT SMETON

Row # 2 LARRY LEWIS, JACK ELLER, EARL RAFFERTY, ED KINDELBERGER, ED BERTREM, COL HOWE THAYER, JIM RWERE, BOB McCOLLOCH, HAROLD SCHWEDES, HANS LUDWIG, RALPH RUDD, TOM HYDENFELT, ANDY CASSIDY, JUDD LEACH, HARVEY TREMBLEY

Row # 3 JOHN ANDERSON, RAY FRANCIS, ED APPELBY, GARY STROH, TED CHAMBERS, REGIE CLARK, TOM COOLEY, MIKE LEONARD, JIM RAE, RALPH ROTHROCK, HOWARD CHASE, ROD STRONKS

DUTCH KINDELBERGER'S MIRACLE MAKERS - JULY 15, 1938



These were the "White Badges" out in the shop that supervised Manufacturing and Quality Control. Some came from Europe and worked earlier at Fokker Aircraft and Berliner-Joyce, others joined NAA at Dundalk, Maryland and still others in California. Many firsts acquired their skills by varnishing wood, doping fabric and "tin snipping" metal. What they lacked in formal education, they more than made up in inspiration, intuitiveness, innovation and inventiveness. Using "Advance Copy" drawings and sketches, they produced the first Mustang in less than 117 days. After sixty-one years, we must still salute them as the "Miracle Makers"!

NOTHING BUT THE FACTS, PLEASE! By Sam Iacobellis

The following is a *rebuttal to an editorial in the Los Angeles Times entitled LET THE B-1 FADE AWAY published on Sunday, July 1, 2001. The Times did not print this response.*

The editorial used old data on the B-1 and made some incorrect statements that would lead readers to inaccurate conclusions on the B-1 program, both past and present.

First, the proposal by Secretary of Defense Rumsfeld was to retire 33 of the 93 B-1Bs with the savings being reinvested in the B-1B program, not, and I quote, "toward acquiring weapons better suited to new challenges." This is a budget priority issue, not a performance issue. The real question is why would the Air Force eliminate 16% of its bomber fleet to achieve less than a 0.1 % savings in the DOD budget? The B-1B is the Mack Truck of the Air Force inventory since it can carry more weapons than any other aircraft. It can carry 24 Joint Direct Attack Munitions (JDAM's) while fighters carry two to four and other bombers up to sixteen. As each of the 33 aircraft is retired, as proposed, the United States will lose significant leverage in long-range Air Power.

Also mentioned were problems including crashes, fuel leaks and glitches within the electronic countermeasure system. There were six aircraft lost over the past sixteen years and most were due to human error. The fuel leaks were a mid-1980s issue because the B-1 was designed with integral fuel tanks (versus placing a fuel bladder inside) to maximize fuel capacity and range. The technique for fuel tank sealing was improved and is no longer an issue on the B-1B. The Defensive System (electronic countermeasures) did experience developmental problems and as enemy threats evolved this system matured but a modern replacement is planned as part of the modernization upgrade with a system common to the F-1B system.

Additionally, the B-1B was criticized for not participating in the Persian Gulf War. The fact is that the B-1B was standing on alert for a nuclear role and the crews had not been trained or the systems modified for a conventional role. This is identical to the circumstances in Vietnam where the B-52H's were standing on alert for a nuclear role, while older model B-52's were used in conventional bombing runs. As noted in the editorial, however, the B-1B along with other bombers did have an active role in Kosovo. In fact, the B-1B made up just 3% of the air campaign in Kosovo yet delivered 45% of the bombs.

Lastly, the B-1B exceeded every aircraft performance goal established by the Air Force ahead of schedule and below budget. The aircraft established multiple speed and range records for aircraft carrying 20,000 and 30,000-kilogram payloads, records that were previously held by the USSR. These facts and the formidable penetration capabilities were certainly not lost on Soviet leadership. After the Cold War ended, Soviet sources, including two Russian academicians, admitted that the B-1B broke their backs because it took away their first strike nuclear option. They believed that it would have been virtually impossible to defend their vast borders against its high speed, relatively low radar cross-section and its extremely low altitude penetration profile. It is this deterrent capability and massive firepower threat that helped end the Cold War and will continue to serve the United States and its Allies for at least another fifty years.

Let the facts be understood before we take positions on critical funding issues. Our bomber fleets should not be reduced as they will continue to play an even more critical role protecting America and American interests from the ever-evolving threats of today's world. In fact, a strong military and bomber force will help maintain our philosophy of Peace through Strength.

Sam F. Iacobellis
Former Rockwell Deputy Chairman for Major Programs and B-1B Program Manager



Amland, Ronald D.
Andersen, Keith V.
Anderson, John A.
Andres, John R.
Arvin, George
Baker, Lloyd E.
Barauskas, Stanley M.
Barry, Pauline I.
Beckner, Boyd H.
Beigle, C. Jack
Bell, M. W. "Jack"
Binder, Thomas M.
Birdsall, William
Birdsill, Arnie
Birgen, Dominic F.
Bishop, C. Ron
Blair, Thomas A.
Blayden, Rob. L.
Boone, John R.
Borger, John M. & Gerry
Bosdet, Rhoda L.
Boyles, Hal
Bright, C. W.
Brown, Gerald G.
Cagle, Reta
Carlson, Stephen W.
Casey, John W.
Cecka, Bill
Cherney, Joseph
Cicchese, Joseph L.
Clune, James G.
Coffey, James M.
Cole, Gary & Barbara
Conrad, William N.
Cooper, R. H. "Bob"
Cooper, Wil.
Cramer, Daniel W.
Cramer, T. D.
Cravets, Thomas R.
Crockett, Robert Jr.
Cross, Robert O.
Crowley, W "Bill"
Culleton, Richard P.
Daugherty, William F.
Davison, Charles T.
Dean, William E.
Day, Chuck & Bobbie
Diekmann, Wendell R
Driskell, James
Durbin, Philip R.
Eaglen, Ralph E.
Eichinger, David C.
Ellis, Thomas H.
Emerich, George F.
Engle, Bernice C.
Ernst, Richard
Fierstos, William A.
Finks, Sid R.
Finlay, Al W.
Finneran, Ted J.
Fong, Frank
Fore, Wallace
Frazier, C.O.
Frushon, Robert A.
Gallanes, Harry
Galovich, Peter
Garcia, J. A.
Gehrkens, George R.
Godward, James R.
Gondo, Tom T.
Goodman, Verlin E.
Goodwin, Robert E
Gore, Donald
Gore, Hal
Goss, Joseph R.
Green, Michael J.
Haas, Larry
Hall, Lester G.
Halpin, William
Hand, William "Bill"
Hanes, Herbert E.
Hansen, Richard
Hardy, Glenn, Jr.
Harris, Vahl E. Jr.
Hartberger, Helen R.
Hello, Bastian "Buz"
Herman, Dr. John J.
Herst, Rosa Lee
Hesseldenz, John S.
Hetzel, Gary P.
Hiatt, Patti H.
Hoffman, Victor Q.
Holt, Roger M
Hotarek, W.J. "Bill"
Hough, Merle E.
Housego, Wilma D.
Hovda, Robert E.
Howard, Ernest V.
Hughes, James H.
Hughes, A. James
Husa, Alfred
Isaacs, Robert W.
Johnson, Jim R.
Johnson, Loren E.
Jones, Kenneth G.
Jones, Robert M.
Jones, Roy E. Jr.
Juelich, Otto C.
Just, Virgil L.
Kabey, Joe
Kelch, Charles
Kelley, Gary N.
Kelly, Glenda
Kemper, Edward H.
Kenyon, Howard H.
Kindelberger, George
Koblosh, John
Koeppe, Robert W.
Kurtz, Geraldine
Lacayo, Henry L.
Lamkins, Albert U.
Langfeldt, Paul
Leadberry, Gordon A.
Leatherby, Sandy
Leatherman, Nolan
Leccese, Vincent H.
Lee, Sang
Lekawa, Edward R.
Levine, David
Levy, William
Lindley, Joy
Lore, Victor R.
Mac Callum Jr.
Margolin, Sanford
Margolis, Morton
Marshall, David
Marta, George
Martin, Jim
Martin, Norman E.
Martin, Thelma
May, Ralph E.
McCarty, Harlan A.
McCleary, Ralph W.
McCormick, G. Paul
McDermott, Thomas
McLain, Joseph P.
McRae, James
Menezes, M. F.
Meyers, Kenneth K.
Mezzacappa, Dr. Michael A.
Miles, Eugene
Miller, Rodman
Miller, William R.
Mock, W. D. "Bill"
Montavon, Vernon L.
Moon, Arthur J.
Moore C. A.
Moore, Joseph G.
Moore, Robert L.
Morgan, Ed R.
Morley, Richard "Dick"
Mulgrew, David B.
Myers, Dale D.
Nease, Robert F.
Nissen, Hal
Nunnally, Col. Jackson
O'Brien, Terrance "T. J."
Okuda, Jack H.
Olsen, Milo R.
Page, George H.
Papp, Arthur
Pappas, George
Paris, Ernest E.
Parker, Norman
Parlier, Shirley
Parsons, Thomas
Patterson, George A. Jr.
Pentecost, Eugene E.
Petersen, Robert C.
Peterson, Paul F.
Phillips, Richard E.
Pierce, Kenneth L.
Pierce, James M.
Pleasant, Solomon H. Jr.
Prescott, Phil J.
Quon, Don
Raiklen, Harold
Ramberg, George E.
Reardon, Philip D.
Redfearn, David R
Roberts, William T. M.
Robertson, Ronald D.
Robinson, Woody W.
Rogers, Carolyn A.
Romo, Oscar A.
Roncevich, Daisy P.
Ruud, Ralph H.
Sammons, Gerald
Sanderman, William F.
Sartain, James
Schell, B.J.& Ken
Schmidt, Jimmy L.
Schmidt, Lloyd C.
Schorsch, Leo J.
Schwarz, Jerry A.
Sexton, Robert
Shaw, Alvin W.
Shuler, Thomas K.
Smith, C. Duane
Snelgrove,Tod
Stacey, R. A. "Dick"
Stakelbeck, Larry F.
Stinson, Dale & Peggy
Stone, J. S. Georgia
Swann, David C.
Szupello, Dorothy M.
Thompson, Donald B.
Thresh, James L.
Turner, Stephen
Van Quekelberg, Arthur
Vance, Armetta C.
Vern, Fred
Vernon, Otis C.
Voiles, Fred
Wegner E. Donald
White, Stanley A.
Whitesell, Charles B.
Wiley, George O.
Wilson, Melvin L.
Wiltsie, W. Lee
Wong, Wally W.
Yarbrough, Norma L.
Young, James
Zemansky, Stanley
Zimmer, Fred P.

SILVER EAGLES are Life Members that have contributed $100 or more

***Honorable Mention ***

Special thanks from the Bulletin Staff and the Bald Eagles to:
WILLIAM HALPIN
for his very generous contribution

Dear Ed,

The X-10/NAVAHO history published in the Spring 2001 issue jogged a lot of my memories. I think, though, that the use of the modified X-10 N6 Guidance Systems for shipboard navigation deserves a few more words. A modestly modified N6 controlled by the Autonetics NATDAN digital differential analyzer, and accompanied by Tom Curtis of Autonetics was the primary position and azimuth reference for the Nautilus during its first ever voyage under the North Pole in 1958.

Another version of the N6, the N6AI, also used the X-10 forward guidance package, this time married to a Bendix G-15 general purpose digital computer went head-to-head with an MIT/Sperry inertial system during competitive tests on a US Navy electronics test vessel, the USS Compass Island. The modified N6 beat the incumbent Sperry system all hollow!

These highly successful N6AI tests resulted in development, and later, production contracts for the N7 SINS systems, bringing in a few billion contracts dollars to North American/ Rockwell/Boeing over the years. Perhaps, more importantly, the N7 saved the Navy's bacon by providing them with a viable self-contained position and azimuth reference for the Polaris program. Without the X-10, the N6 probably would not have existed at the time it was so badly needed. The principal program/project drivers for this effort were Don Pickerell and Virge Perkins of Autonetics.

By the way, I believe that the N6AI system, complete with the tie-in equipment, code tapes and manuals still resides somewhere in the bowels of the Smithsonian. To my knowledge, the N6AI represents the first all digital general-purpose computer controlled real time system. Other contemporary systems were using analog computers or digital differential analyzers for their "smarts".

Sincerely, Mac McMurran, Mesquite, NV

Dear Ed.

I want to say hello to my old friends of so many years. I joined NAA in 1948 and was assigned to fuel system design analysis and test. Those were interesting times in aerospace and there were all manner of challenging design problems.

The B-70 Mach 3 bomber was a new breed with a host of special problems. It cruised at 70,000 feet in a 450F environment like your oven. Imagine storing a fuel tank in such a place for several hours! The tanks were insulated with newly developed sandwich panels. The tanks had to be in an inert gas atmosphere to avoid auto-ignition of the fuel. Specifications were written to establish standards for good quality fuel to prevent fuel gumming and coking.

Fuel pump cavitations by the boiling fuel was also a possibility. The tanks were designed with lightening holes in the ribs sized for proper fuel drainage and rapid filling. Cleve Kimmel put together a computer program to size the holes. The fuel usage had to be automatically sequenced for proper CG control. An onboard computer was designed to do this.

Many other computer programs were developed for analysis of refueling lines, engine pumping and venting. The whole system was tested in a working mockup as well as simulated by a computer mission analysis, including the effects of aerodynamic heating.

I was one of twenty engineers assigned to a yearlong design study, led by Ron Robinson of Aerospace Plane. Our designs were based on carrying into orbit a box 20' x 10' x 10' which was remarkably similar to the actual Aerospace Plane cargo compartment that came later.

Nowadays, I'm here in Fallbrook enjoying life, growing avocados and writing books. Keep up the good work.

Cordially, George Patterson, Fallbrook, CA

The First Mustang

In early 1940, the British government was desperately seeking to supplement the supply of fighter aircraft from home production by purchasing modem types from the USA. Impressed with the Curtiss Hawk 81A, the British Purchasing Commission contracted with Curtiss to build the newer Hawk 87A, designated as the RAF Kittyhawk 1 or the USAAC P-40D and powered with the Allison V-1170-39 engine.

With Curtiss production strained to full capacity, the British Purchasing Commission turned to a new company, North American Aviation, Inc. with a request that it undertakes license-production of the Kittyhawk 1 for the RAF. The company's president, "Dutch" Kindelberger, countered with an offer to design and builds a totally new airframe around the same V-1170 engine with improved all-around performance.

The British Purchasing Commission accepted the NAA offer with the proviso that the first prototype should be completed within a period of 120 days. Design work began immediately at the new factory in Inglewood, California. True to its word: the prototype designated as the NA-73X was rolled out only 117 days after the initial go-ahead given by the British.

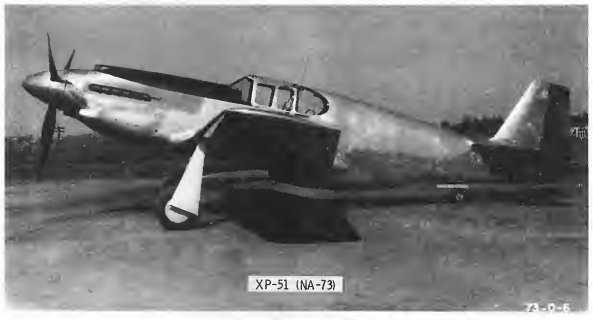
Thus, an engineering legend was born and the first Mustang stood to accept its place in aviation history. The Allison V-1170 engine still had not arrived and the airframe was supported on wheels borrowed from an AT-6 trainer but the conditions of the contract had been met.

Information from an article by Christopher Shores



A British P40 *Kitty hawk,* with Allison engine

Photo source: Aircraft of the World



The original XP-51 (NA-73X). *Photo from NAARB archives*

BALD EAGLES ANNUAL REUNION

The 40th Annual Bald Eagles Reunion will be held on Saturday, April 13, 2002 at the Proud Bird Restaurant, 11022 Aviation Blvd. (At 111th Street).

Doors open at 10:00 AM for social hours. Seating for lunch is 12:00 noon.

If you plan to attend, send a check payable to Bald Eagles, Inc. (The cost is $20.00 per person) and mail to:

Val Yarbrough
520 Del Oro Drive
Ojai, CA 93023-1805
Tel: 805-646-2283

Include with your check the name, you wish to have on the badge, and the name of each guests for whom you are ordering a ticket. Tickets and badges will be issued as you register at the entrance.

Cancellation notices must be received by the treasurer before March 25, 2002. There will be no refunds after the deadline.

This notification for the event will appear again in the Winter issue of the bulletin. There will be no reminder mailed to members.

Share this news with others who have an interest in North American Aviation/Rockwell, a company with an extraordinary heritage of products and people.

There is no minimum company service requirement to attend the reunion — just remit your payment for the reservation and show up for a great time and visit with old (and not so old) friends to reminisce on past years.

Parking can be difficult — Car pooling and early arrival is encouraged.

See you there.

60th Anniversary

Larry Livers and his beautiful bride Bette celebrated their sixtieth wedding anniversary on June 18, 2001 with their family and friends in Las Vegas. During the forty years that Larry worked for North American Rockwell they lived in Westchester. They are currently enjoying their lives together at Oceans Hills Country Club in Oceanside, California.



For Sale

One (1) KT175 Kar-Tote (Tow Dolly) Regular size.
Date of purchase: March 11, 1994 at Camping World Anaheim, CA. Has a spare tire on a rim, never used; two (2) straps to hold the front tires; four-way electrical wiring; also wiring for towed vehicle lights.
Original price: $1336.96
Asking price: $950.00 or best offer.
California license good until December 2005.

Write or call
Mr. Loren E. Johnson
2000 Iroquois Avenue
Long Beach, CA 90815-3408
Phone (562) 431-1733

Mr. Loren E. Johnson , a Silver Eagle, is our first reader to offer items for sale through the Retiree Bulletin. Good luck Mr. Johnson!



Walt Spivak, 1909 –2001

SPIVAK, WALTER (Walt) A., 91 - Born on August 14, 1909, he passed away at his home in Pearblossom, CA on June 29, 2001 of cancer. A graduate of the University of Minnesota, Walt joined NAA in 1936 as a draftsman at the Kansas City facility. In just eight years, he became a division chief engineer. After WW II, he transferred to NAA in California where he became Vice President of Engineering. The list of aircraft in which Walt was involved include the B-25 *Mitchell*, P-51 *Mustang*, B-70 *Valkyrie* and the B-1 *Lancer*. Other aircraft included the F-86, F-100, F-107 and F-108. Recognized for his achievements, Walt received the prestigious AIAA Fellow Award. He worked for NAA/Rockwell for over 48 years and took final retirement in 1984 at the age of 75. He remained active in real estate in Littlerock, CA until 1997. Walt was a brilliant man and was truly a legend in his profession.

BAKER, VIVIAN JEAN - passed away on August 19, 2000. She was an executive secretary at Autonetics for 20 years. Information was taken from an obituary in a local paper.

BIRD, CLINTON LEO - passed away on Father's Day, June 17, 2000, with his family at his side. Clint worked for North American/Rockwell as an engineer for 40+ years.

BISHOP, TED - passed away in March 2001. Ted was a pilot with the US Army Air Corp in WW II, he flew P-51s, B-17s and B-29 bombers. He flew reconnaissance weekly near the French Coast before the Normandy invasion on D-Day. In Post-war years, he was a test pilot for Boeing. Dianne Marsh, RN (Retired from Corporate Medical) notified us.

BOGGS, WARREN, 80 - passed away on July 13, 2001, of complications after contacting pneumonia. Warren retired from North American Rockwell in 1976 as manager of Photographic Services moved to Fallbrook, CA, to grow avocados and lemons. Warren sang in the North American Chorus and was a long time member of the NAA Rod and Gun Club. Jim Hurzeler, John N. Lynn and Howie Burhop, all from Fallbrook, notified us.

BRISTOW, EVERETT K, 83 - passed away on July 4, 2001 at his home in Hemet, CA. He was a machine operator at NAA/ Rockwell for 30 years. Information from an obituary sent in by Gene Somers, Idyllwild, CA.

BUTLER, EARL B., 90 - passed away July 23, 2001 at his home in Manhattan Beach. He retired from North American Aviation after 43 years of service. Information from an obituary notice sent to us.

CARPER, GRACE L., of Red Bluff CA. The Bulletin was returned marked "deceased".

DALTON, DONALD FRANCIS, 68 - passed away February 20, 2001 in Aruba while on a cruise. He worked for more than 36 years as a technician,, engineer, supervisor, computer programmer and computer systems manager and retired in 1993. His wife, Audrey notified us.

DOLAN, MIKE, 76 - of Fullerton, CA, passed away July 2, 2001. Mike was a manager of Contracts and Proposals and retired from Seal Beach, Space Division with over 25 years of service. Millard N. Washington (Retired), of GPS Contracts Seal Beach, notified us.

DUNCAN, MICHAEL S., 56 - of Huntington Beach, CA, a project manager for Rockwell International, died July 14, 2001, of heart disease. Maxine Haun notified us.

FROST, LOVEAL, 91 - OF Orange, CA , died on August 25, 2001 of natural causes. He was a retired electronics assembler for NAA/Rockwell. Maxine Haun sent a newspaper obit to notify us.

FULLER, SYLVES W. (SYL), 96 - passed away June 2, 2001, in Santa Monica, CA. Syl worked for North American Rockwell for 40+ years at LAD. Syl was known for keeping a record of all of the people whoever worked for him in Blue Prints, Trucking and Production Control and looking them up to wish them a happy birthday wherever they were subsequently working, if still in the plant. His granddaughter, Marilyn Nichols, Camarillo, CA, notified us.

GARCIA, ARNOLD, 73 - of Yorba Linda, CA, died August 11, 2000. Information from an obituary in an Orange County newspaper. No other information was available.

GOW, KENNETH P. 84 – died in Whittier, CA on August 12, 2001, after a short illness. Ken worked at Douglas Aircraft during WW II and then in 1950 joined the NAA Aerophysics Lab in Downey. He worked on numerous inertial navigator projects at Autonetics until his retirement in 1986. One of his innovations was an unconventional periodic platform rotation (called the "Gow Flip") used on a class of inertial navigation systems. Bob Nease notified us by e-mail.

HALFERTY, FLOYD "HAL", 80 - of Arroyo Grande died on August 19, 2001. Hal retired as an aerospace engineer and worked for many years for North American Aviation in Southern California. John J. Herman of Cambria notified us.

HELWIG, CLIFF, 59 - died at home in his sleep, of natural causes on July 19, 2001. He worked in the Southern California electronics industry in different capacities but was most proud of his time at North American Rockwell on the Apollo Space program. Information from an obituary sent in by Joe Pirzynski.

JAKOBSON, LE GRAND MAX, 83 - of Westminster, CA, died July 2, 2001, of natural causes. He was a retired electrical planner for Rockwell International. Maxine Haun notified us.

LARA, EDMUNDO, 77 - died June 13, 2001, at his daughter's residence in Torrance, CA. He was a sheet metal mechanic with Rockwell International in Anaheim. Gene Somers, Idyllwild CA, notified us.

LAROSE, EDNA ALEEN, 84 - passed away in Torrance, CA, on June 5, 2001. Edna was a registered nurse for over 40 years and had worked for Rockwell on the Space Program. She served as a First Lieutenant in the US Army during WWII. Information obtained from an obituary in a local paper.

LUKE, BILLIE J., 75 - passed away at Manorcare in Hemet, CA, on July 14, 2001, from cancer. He retired from Autonetics in Anaheim in 1988. Dick Peckhani of Homeland, CA notified us.

LEWIS, CLAUDE L., 77 - died on August 13, 2001, in Orange, CA, of heart failure. Claude started in 1941 at Vultee Aircraft in Downey and worked in Manufacturing Engineering at LAD, where he was well known as a shop contact engineer. He retired in 1981 after 40 years of service with NAA/Rockwell. A good friend of Claude's notified Michel Juif, editor.

MENAGER, EVELYN J., - died on June 25, 2001 at Norwalk. Evelyn worked in Production Planning before she retired from Rockwell International. June Rudometkin notified us.

NIELSEN, SHERMAN VICTOR, JR., 77 - of Garden Grove, CA, died July 22, 2001, of heart disease. Maxine Haun notified us.

PAGLIASSOTTI, ARIO JOSEPH, 71 - passed away August 4, 2001. He worked for 40 years in the aerospace industry at Boeing and Lockheed. Information from an obituary sent in by Joe Pirzynski.

PETERSON, SALLY, 81 - of Lake Forest, CA, an electronics assembler for Rockwell International, passed away June 28, 2001, of vascular disease. Information from an obituary sent in by Maxine Haun.

PHILLIPS, DEAN, 84 - a former labor and public relations executive at North American Rockwell, in Ohio, died January 13, 2001, at his home in Rockville, MD, from heart disease. He worked for North American Rockwell for decades in Los Angeles, CA, Kansas City, Kan.; and Columbus, Ohio. Mr. Phillips was the president and chief executive officer of what is now Goodwill Industries International and was active in many other philanthropic organizations. Carole W. Phillips notified us.

PHIPPEN, WILLARD D., 87 - passed away in Fairfield, CA, on July 22, 2001. Mr. Phippen was a pilot instructor in the Air Force during WWII and was a retired machinist for Rockwell International where he was employed for 40 years. Information obtained from the obituary in the Daily Breeze.

POIZNER, DEL, 83 - passed away May 18, 2001, of bronchitis leading to cardiac arrest. Del was a cost analyst at LAD with over 33 years with Rockwell. His wife, Jean, notified us.

PRITCHARD, GEORGE L, 80 - passed away of natural causes. George had worked in Quality Control management at Long Beach, Downey and Anaheim. He retired in 1994. Ben Smith, Fullerton, CA, notified us.

RAINER, LA JUANA - of Grants Pass, Or, passed away July 3, 2001 of lung cancer. La Juana was in management for many years in Purchasing at LAD and Rocketdyne, retiring in 1994. Rhoda Bosdet and Ken and Moonyeen Fowler notified us.

RAMILLER, RAYMOND C., 87 - passed away on July 15, 2001, in Prescott. AZ. Ray worked in the Graphic Art Department at LAD. We were notified by Norman Deitchman, Chino Valley, AZ.

REAGAN, TOM - passed away May 10, 2001. Willie Miller notified us. No other information available.

SCANLAN, PHILIP R. "PETE" - passed away July 28, 2001 from complications related to Parkinson's disease. He was an aerospace engineer at Rockwell International for 36 years and dedicated volunteer manager of women's track and field. Information from a local newspaper obituary sent in by Joe Pirzynski.

SEEWOSTER, JOHN, 59 - passed away May 3, 2001, of kidney cancer, in Beaumont, CA. John retired from Boeing Palmdale Space Division in 1997. He started with North American Aviation in 1960 at the Fullerton plant then served as a manager at the Rockwell Space Division in Downey before transferring to the Palmdale plant. His wife, Melody Seewoster, notified us.

SHERRER, AL - passed away on July 13, 2001. He worked in Logistics at Downey. He retired ten years ago. John Olivas notified us: no other information were available..

SHORE, HAROLD J. (HAL), 74 - passed away on April 28, 2001, due to emphysema. which resulted in respiratory failure. Hal retired in 1987 after 40 years of service. He was Manager of Surplus Sales and the Employee Store at the Autonetics Anaheim facility. We were notified by his wife, Milly, of Redding, CA.

SPAULDING, KEITH HUGH, 70 - of Aliso Viejo, CA, a senior flight-crew trainer for Boeing, died July 14, 2001 of cancer. Information from an obituary sent in by Maxine Haun.

THANOS, ANDREW X., Ph.D., 78 - passed away July 26, 2000, in Santa Monica, CA, after a long illness. In 1962, he joined North American Aviation as Director of Microbiology, and established the first microbiology department. Information from an article in the El Segundo Herald sent in by George Wiley.

TUTTLE, JIM - passed away of heart failure on August 31, 2001 at his home in Grass Valley, CA. Jim retired from the Los Angeles Division in 1984 after over 40 years of service with NAA/Rockwell. He worked in Engineering Crew Accommodations and Escape Systems Design. Jim was well known throughout the company, he had been affected with polio since the 40's. John Dzurica called Michel Juif to report his death.

WESTER, CHARLES L, 65 - formerly South Bay resident, passed away June 21, 2001, in Lake Havasu City, AZ. He was retired from Rockwell International.

WOOD, SAMUEL EDWARD - passed away on July 31, 2001. He worked in aerospace at Rocketdyne for 32 years. Information from an obituary sent in by Joe Pirzynski, Inglewood, CA.

RETIREES BULLETIN OFFICE
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Seal Beach, CA 90740-7644

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North American Aviation Retirees Bulletin

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REPLACEMENT FOR THE SNJ?



In August 1945, North American Aviation received a contract from the Navy for two prototypes scout trainers as possible replacements for the SNJ.
Designated as the XSNJ2J-1 (NA-142), the airplane was powered by an 1100 hp Curtiss-Wright *Cyclone* R-1800-78 radial air-cooled engine.
A "tail-dragger", it incorporated the famous P-51 empennage and an arresting gear for carrier landing practice. Armament consisted of two 50-caliber machine guns with accommodations for bombs and rockets. It was designated to meet the Navy's new training program that combined primary and basic training requirements and it easily outperformed the SNJ or T-6.
Although the Navy did not adopt the program and the airplane never went into production, many features of this airplane were later incorporated into the T-28. The first flight of the first XSN2J-1, BuAir s/n 121449, was made by George "Wheaties" Welch on February 10, 1947 from the Inglewood facility.

Article by Richard Morley, Tucson, AZ and official NAA XSN2J-1 photo from NAARB archives

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION
Retirees Bulletin

WINTER 2001

Wishing you a Holiday Season filled with Peace and Joy

Inside:

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THE FASTEST FLIGHT OF THEM ALL by RAYMOND PUFFER



Photo Courtesy of Boeing Historical Archives

MODIFIED F-86F PREPARED FOR SHIPMENT TO KOREA AS PART OF *PROJECT GUNVAL*

DEAR NAA RETIREE BULLETIN SUBSCRIBERS

This is our final 2001 issue and we thought it would mark a happy milestone for us and for our readers. However, the tragic events of September 11th have placed a heavy load on our hearts and minds. No matter, we are Americans! We shall recover our dead and wounded, we shall honor them, and then we shall hunt down the bastards that did this to us and punish them severely.

Many of you have already sent in your subscription renewal checks and enclosed notes indicating how pleased you were with the articles we had in the issues this year. We spoke with John Moore and he told us that many of you took a moment to call him in Cocoa Beach to tell him how much you enjoyed his article and to wish him well. We have another of his teeth-jarring sagas in this issue excerpted from his book *THE WRONG STUFF,* which we think you will enjoy.

Once again we are blessed with a covey of fine writers that have put together some excellent stories. For some of you this will be all new, for others it will be déjà vu ---you were there and you experienced the events related. We hope you enjoy them the second time around!

Our cover story by John Henderson relates to making a major design change to the F-86 Sabre in the heat of battle. John was the field rep that delivered forty-nine F-86A-5s to Korea aboard the mini-carrier USS Cape Esperance and stayed on to support the 4th Fighter Wing. Gene Ricketts served two management stints at the Tulsa Division and he provides some excellent insights in the constant battle in which survival depends on winning the next subcontract. Finally, from Edwards AFB, we have another splendid report on the X-15 by our guest historian, Dr. Raymond Puffer. We also have Mike Lombardi from the Boeing Archives in Seattle. He has graciously provided us access to the vast library of NAA pictures for which he is responsible.

As you know, several members of the NAA Retirees Bulletin staff are leaving with the completion of this issue. Our editor, Michel Juif, and co-editor, Walt Jones, are stepping down for a well-deserved respite. They have both served for more than ten years and have brought skills to this project that will be difficult to match. Two years ago when all corporate funding evaporated, Michel virtually had to pass the hat around to provide seed-money to restart the bulletin. Starting with those modest funds, we are now on solid financial ground and have over 2800 paid subscribers. Thank you Michel and Walt!

Since this is the last issue for 2001, for many of you it is time to renew your subscription. If your address label has December 2001 above your name, your subscription ends with this issue. For your convenience, we have provided a subscription renewal form elsewhere in this issue. However, if you want to keep your bulletin intact, simply send us a check with your instructions on a separate piece of paper. Also, don't forget to renew any gift subscriptions, which you ordered for 2001. Whether you decide to renew or not, thank you for hanging in there with us this year and God Bless you All!

NAAR BULLETIN, an affiliate of the **Bald Eagles, Inc.,** is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

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LOST SHEEP?
The Post Office returned copies of the bulletin addressed to the following subscribers as "Return to sender " or "Person Unknown". If you know of their whereabouts, please notify them or us of their status.
George K. Adams - Torrance, CA
John R. Hutcherson - Bullhead City, AZ
S. L. Kelly - Inglewood, CA
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Dale U. Young - Carson City, NV

NAA/ROCKWELL RETIREES RESIDING IN NEVADA

THERE IS A SIGNIFICANT NUMBER OF NAA/ROCKWELL RETIREES NOW RESIDING IN LAS VEGAS AREA, IT HAS BEEN SUGGESTED THAT A SOCIAL GROUP BE FORMED TO MEET PERIODICALLY FOR BREAKFAST OR LUNCH. TO ASSESS THE INTEREST, AUTONETICS RETIREE, FRANK PELTESON, AGREEDTO SERVE AS THE CONTACT. TO REACH HIM, PLEASE CALL 1-702-655-1955, FAX 1-702-655-4216, OR E-MAIL AT FPELTESON@AOL.COM.

THE FIRST **SATURN S-II REUNION** WILL BE HELD ON MAY 18, 2002 AT THE GRAND HOTEL IN LONG BEACH, CA, FOR DETAILS, CONTACT **AL OTTO** AT (714) 775-4721 OR E-MAIL HIM AT GYPSYMA@AOL.COM

NAA/ ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Bill Kelley at (714) 637-9374
The Antelope Valley Retiree Club meets temporarily in Courson Park at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell retirees are welcome. For information call Bill "Tiny" Kisler at (661) 273-0213.
Boeing Valley Retirees Club meets on the 3rd Thursday of each month at the Canoga Park Rec. Center. 8500 Fallbrook Ave. Canoga Park, CA. President: Jennie Muncaster, dial (818) 341-8919
Autonetics Retirees meets for lunch at 11:45 AM on the 2nd Wednesday of each month at the Rembrandt Restaurant, 909 E. Yorba Linda Blvd.. Placentia CA. All Autonetics retirees, spouses and friends are invited. .
"Ye Olde Pharts Breakfast Club" now meets for breakfast at Polly's Pies at 2025 N. Tustin Ave in Orange on the 4th Thursday of each month at 10 AM . For information, call Don Metzger at (949) 495-5374
A group of NAA Retirees meets for breakfast on the 1st Wednesday of each month at the Knott's Berry Chicken Farm Restaurant at 8:15 AM. All are invited.
A group of Retirees from Seal Beach meets at 11:30 AM at "The Fish Co", Los Alamitos and Katella, on the 3rd Wednesday of each month. For more information, call Marvin Blaski at (714) 848-5717 or e-mail: mblaski@aol.com
"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meets for lunch on the 2nd Wednesday at 11:30 AM at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd and Mariposa Ave.
"The Old LAD Stress Group" meets approximately every two months at Mimi's Café in Torrance, CA for breakfast. If you were in the old LAD Stress Group and want to join them, contact Gene Laxton (310) 378-3113 or Ed Rosenthal at (310) 375-8933
The Downey Engineering Group of Retirees known as "The Choir Boys" meets every Thursday for lunch at various restaurants from Seal Beach to Downey. Call Al Risi at (714) 892-5725 for meeting location.
GPS Breakfast Club meets every Wednesday morning from 6:00 to 8:00 AM at the Primrose Restaurant at the corner of Seal Beach Blvd and Westminster Blvd. All are invited, retired or not. For information call Fred Shitara at (714) 750-1016
The Facilities, Industrial Engineering and Plant Services Retiree Group meets on the 2nd Thursday each month at the Jolly Roger in the Long Beach Marina at 11:45 AM. Friends and wives, former and current employees are welcome.
The North American Rockwell Retirees Club of McAlester Oklahoma (a satellite of Tulsa, OK) meets each month on the 3rd Tuesday, 10:30 AM at the Down Town Meeting Place. For more Information contact:
J. A. Darden, 343 W. Adams Ave. McAlester, OK 74501 or phone (918) 423-0706.
Tulsa & McAlester Retirees meet for breakfast at 8 AM on the 2nd monday of March, June, September and December at the Ramada Inn, 8181 East Skelly Drive in Tulsa. Call Harry Phillips for more detail at (918) 838-3716.
The North American Rockwell Retiree Group of Columbus, OH. Engineers and Professionals meet each month on the 3rd Thursday at 11:30 AM at the Berwick Park House. For more info. contact Byron C. Solomides at (614) 486-3239.
NAA/Rockwell U.A.W. Group of Columbus, OH, meets on the 1st Monday of each month at Noon at the Old Rockwell Park (North Hamilton Rd.) E. Hamilton at (740) 927-5940.
Autonetics Group that includes Marine Systems, Program Office, Project Office, System Test, Engineers, Designers, etc. meets for lunch on the last Wednesday of each month at the HomeTown Buffet, Rose Avenue and Alta Vista Drive in Placentia. For more information call Mike Vohs at (714) 762-1925.
A group of NAA Retirees from 101 Tooling meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at the Cimarron Café at 5160 190th St., West of Anza Avenue in Torrance.
Autonetics Finance Luncheon. This group meets for lunch the last Wednesday of the month at Carrow's located at 100 N. State College in Fullerton. Anyone interested can call Ken Cantwell, at (714) 970-7171 or send e-mail at: kcantrell@prodigy.net, to obtain more information.
Autonetics Industrial Engineering and Maintenance Retirees meet for lunch the 1st Thursday of each month at the HomeTown Buffet, 390 McKinley, located in front of Home Depot, in Corona. For more information call Don Burt at (909) 698-0072
NAA Tech Reps Assn. (TRA) Breakfast Club meets the 1st Tuesday of each month at the Carlsbad Airport Restaurant at 9:00 AM.
For more information call: El Presidente, Rafael Colunga at (760) 940-0525
A Group of Engineers Mgt. , meets on the 3rd Tuesday monthly at Denny's on Imperial Hwy and 57 Fwy. at 11:30 AM for lunch. For more information call Ed Moran at (562) 697-9949
Autonetics Flight Control Retirees meet on the 3rd Thursday of every month, except December, at 11:30 AM at "The Lamppost Pizza House" located at 17568 Yorba Linda Blvd. corner of Richfield Road in Yorba Linda. Call Jim Anderson at (714) 779-5620 for more information.

ANNUAL EVENTS

Bald Eagles Reunion - The 40th Annual Reunion is on April 13, 2002, call Val Yarbrough at (805) 646-2283
Grants Pass Picnic - 1st Wednesday after Labor Day, September 4, 2002
NAA-K B-25 Reunion - will be held on August 18, 2002. For more information call Harry J. Desko (913) 287-7223 or write to him at 3024 N. 47th St., Kansas City, KS 66104.
Flying Horsemen For year 2001, information regarding events and reunions may be obtained from the troop secretary, Harold Shapiro at (714) 993-3496, FAX (714) 993-1208, e-mail shapsplace@aol.com or mail to 17822 Kennon Dr., Yorba Linda 92886-3919
The Hangar Gang - This group of retirees meets approximately every 6 months. For time and date or additional information call Gene Salvay (818) 788-3974, or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.
Annual Flight Test Instrumentation Reunion - This group of retirees meet annually at the Fullerton Elks Club. For Information call Ed Mosbrook at (714) 531-8060 or Frank Vigil at (562) 691-0236.
Tech Rep Association—a group of retired Field Service Technical Representatives has a yearly picnic in June at the park in Fallbrook. For more information, contact the TRA President Rafael Colunga, 5705 Redondo Dr., Bonsall, CA 92003 or at his e-mail address: rafael@nctimes.net
The Annual M&P, P.D.L., "Friends Christmas Luncheon". This group of retirees (and some still employed) have assembled in mid-December for a festive luncheon and gab-fest for the past 18 years. The last two luncheon were at South Bay Grill and Luig's.
Those wishing to receive notice of next December Luncheon, please call Fred Koeller at (310) 545-8854.
2001 Group Reunion Luncheon for TRI-STATE Members - This group will meet on Wednesday, October 17, 2001 at 11:00 AM to 3:00 PM (PST) at the Lancaster Elks Lodge #1625, 240 East Avenue K. Lancaster, CA 93534. For reservation call one of the committee member : Bill Bright at (661) 943-7276 or Steve Carlson at (661) 944-9698 or Jim Beall at (661) 945-1326
E-mail: bbright@hughes.net E-mail: Stvnvee@msn.com E-mail: jjbell@as.net
Saturn S-II Reunion - The first reunion will be held on May 18,, 2002 at the Grand Hotel in Long Beach, CA. Those interested in paticipating or attending should contact Al Otto at (714) 775-4721 or e-mail him at gypsyma@aol.com.

The NAA-K B-25 BOMBERS BUILDERS held their annual reunion on August 19th at the Wyandotte County Historical Museum in Kansas City. Participants included Alice Desko, Harry Desko and Pam Reichart of PCB-KCPT TV-19 standing in front of a B-25 tail fin. Pam is the producer of the documentary "OVER HERE! The Story of Kansa City & World War II".





A wonderful Navion Fly-in was held at the Torrance Airport on Saturday, July 21st with two airplanes flown in from Santa Barbara by NAA Retirees and owner pilots. These were joined by three planes already stationed there and another flown up from Gillespie Field. The day was capped by a splendid lunch hosted by the Blair family in their home. Among the group were:
(L. to R.) Keith Franklin, Val Yarbrough, Brad Hensley, Mac Blair, Elizabeth Blair, Linsey Blair, Chan King, Phyllis Martin, and (Kneeling) Ted Stennis and Curtiss Stennis. Other included Frank Compton, Sy Symons, Ralph Martin, George Mintzer, and Julius and Marianne Laviano.

THE JOINT ZERO LAUNCH AND WHEELS-UP LANDING PROGRAM

BY CDR. JOHN MOORE, USN Ret..

It seemed that in the early post World War II era, paralleling the development of a reliable afterburning device to improve fighter aircraft performance, an enlightened group of scientists, obviously not aeronauts, concluded that the most inefficient, least productive part of a fighter plane was the landing gear system. After all, what purpose did this useless excess weight serve during an intercept mission at high altitude? Empirical data indicated that the performance of a swept wing jet fighter such as the Grumman F9F-8 might be improved by as much as fifty percent if this airplane had been designed without landing gear. This was an inspiring hypothesis!

An aggressive program was established involving the Navy, Air Force and the British Naval Air Arm to study the feasibility of such a revolutionary concept and to look at such minor details, such as, how to take off and land this miracle weapon and what to do about ground handling procedures. Thus evolved a Zero Launch Program undertaken by the U.S Air Force and a Wheels-Up Landing Development Program, or perhaps better defined as a No-Wheels Landing Development Program undertaken simultaneously by the British, U.S. Navy and U.S. Air Force.

I was privileged to be an observer at Edwards Air Force Base for Phase II of the Air Force Zero Launch Program. Phase I had been somewhat successfully completed by the United States Air Force using a straightwing F-84 jet fighter as the missile. For Phase II, the Air Force chose the F-100 Super Sabre jet, and with the wisdom commensurate with the maturity of this elite branch of the service, they selected a civilian test pilot to fly the test program — a prematurely gray-haired fellow named Al Blackburn of North American Aviation.



Photo Courtesy AFFTC History Office

FOR THE PHASE II OF THE AIR FORCE ZERO-LAUNCH PROGRAM, AN F-100 SUPER SABRE WAS PERCHED ATOP THE LAUNCHER, ANGLED AT 30 DEGREES SKYWARD WITH LANDINGN GEARS DOWN

For this venture, the F-100 was perched on a launching pad, angled about 30 degrees skyward, and a solid-state rocket booster was strapped to the aft ventral side of the plane immediately below the horizontal stabilizers. After Blackburn had been inserted into the cockpit and strapped in, the F-100 jet engine was started in preparation for launch. Blast-off was made with the wheels down, which indicated to me some apprehension about the success of the mission. Following afterburner ignition in the F-100, the solid rocket booster was ignited initiating lift-off



Photo Courtesy AFFTC History Office

The first zero-launch in the F-100 was a success in all respects with the spent booster being jettisoned at approximately 200 knots.

A normal landing was made at Edwards after this marvelous achievement. Several other successful launches followed.

The final launch was also a gratifying success with one minor exception, i.e., failure of the rocket booster to jettison, which resulted in an aircraft center of gravity somewhere in the vicinity of the horizontal stabilizers. By the conclusion of this flight, Mr. Blackburn had demonstrated not only the zero-launch capability of the F- 100 but its ejection system as well, with both vehicle and pilot landing in the desert, although several miles apart. Blackburn ended up with bad ankles from the event, and the F-100 ended up with bad everything. This terminated the Zero Launch Program.

Having ingested all the glory of the Zero Launch Program I could assimilate, I was dispatched to the site of the Air Force Flexdeck Landing Program to observe these exciting undertakings and to hopefully benefit from their experience in such drama. The Air Force was making final preparations for arrested landings into their inflated Flexdeck. They had selected the straightwing F-84G as their vehicle, most likely because in the event of any loss, they had little to lose.

There was concern that damage would occur to the test vehicle's flaps following hook engagement with the arresting cable and subsequent deck/vehicle contact. Consequently, a micro-switch was installed in the arresting hook face that would initiate flap retraction upon hook contact with the arresting cable, thus avoiding flap damage during landing. The result was that in the first attempted arrested wheels-up landing into the Flexdeck, the hook struck the approach ramp, bounded over the arresting cable and returned to deck contact as the airplane flew by. The hook then encountered a puddle of water that had been sprayed on the deck for lubrication, the impact of which closed the micro-switch in the hook and the flaps were retracted. The F-84 settled on the deck, dropped into the desert and ground to a halt in a large cloud of dust. The result was excessive damage to both pilot and test vehicle, putting both out of the program.

ZERO LAUNCH (Continued)

A second test vehicle was prepared and a second pilot willing to fly the mission was located, heroically armed with little knowledge of what had transpired to this point. Following a brief training program for the new pilot, the Air Force scheduled its second landing attempt.

In this landing, the hook successfully engaged the arresting cable, causing the F-84 to pitch violently into the deck on its nose for a series of three or four bounces before coming to a halt. Motion pictures showed that at first impact, the pilot, a tall lad who was strapped in snugly, disappeared completely into the cockpit. This left impressions of the pilot's lateral incisors in the top of the control stick and caused structural damage to his vertebrae. The result caused the hierarchy of a tailhookless Air Force to reconsider what the hell they were doing in this program anyway: wherewith they abandoned the whole thing, leaving further evaluation of this extraordinary concept in the capable hands of the United States Navy.

It should be stated that after observing these historic events of zero-launch and wheels-up landing, this pilot did some soul searching for a reason as to why he should risk his cute little ass furthering this wacky program — and the answer was clear — stupidity.

Excerpted from the book "THE WRONG STUFF" by permission of the author



Photo from Author's Collection

LT. JOHN MOORE IN A GRUMMAN F9F-7 CONDUCTING "WHEELS UP" WITH THE NAVY FLEXDECK AT PAX RIVER NAS.

SILENT MAJORITY (Continued from page 15)

STEIN, PAUL D. - died October 24, 2001. Paul retired from Autonetics, where he worked in Financial. He spent many years as a Director of our Rockwell Credit Union, as well. Maxine Haun notified us.

STEWART, RUSSELL T. - passed away September 29, 2001 Isabel, his wife of 58 years preceded him in death June 4, 2001. Russell worked for North American Rockwell for 43 years in tooling and tool planning and worked at Northrop for six years after that. Information from an obituary in the Daily Breeze sent in by Ronald L. Conlon and also by John Wyatt

STITES, STANTON R., 80 - died on June 9, 2001 of complications during heart surgery. He lived in Westlake Village, CA. Stan joined NAA in 1939 and retired in 1982 as Manager of Corporate Office Support Services. He was transferred to Pittsburgh in 1973 and worked there for about five years before returning to California. Richard K. Wilson notified us.

SUBBERT, ELMER JOHN, 82 - died in September at Menifee Valley Medical Center in Sun City CA. He was an inspector for Rockwell International in Anaheim for 20 years. We were notified by Mrs. G. M. Preston, Canyon Lake, CA.

SWEENY, WILLIAM J. JR., 78 - passed away on November 17, 2001 in Hemet, CA. He was a director of contracts at Rockwell International for 28 years. We were informed by an obituary sent to us by Gene Somers

TAPP, WESLEY, 76 - passed away in Grand Junction, CO, on October 6, 2001. He retired from North American Rockwell after 35 years of service. Many of his years of service were in Engineering Flight Test. LAD. His friend, Robert N. Cadick, at Edwards and Palmdale, notified us.

TUTTLE, JAMES H., JR. - passed away August 31, 2001, in Grass Valley, CA. with his family at his bedside. Jim retired after 33 years as an aircraft design engineer at Rockwell International. He was an avid aircraft historian, authoring numerous articles for aviation magazines and writing a book about aircraft ejection seats, currently in the process of publication. Information from an obituary in the Daily Breeze.

VAN CAMP, DAVID JOHN, 82 - died July 18, 2001, at his home in Sun City, CA. He was an electrical engineer with Rockwell International and Hughes Aircraft.

WALKER, DON - passed away September 1, 2001. He had been suffering from severe health problems for several months. Stan Haugh notified us.

WHITMORE, JOSEPH SHARP, 83 - died of congestive heart failure on July 17, in Fallbrook, CA. He retired from Gibson, Dunn & Crutcher in 1981 as a senior partner and member of the Executive Committee after working with the firm his entire legal career spanning five decades. One of his many clients included North American Rockwell. He was legal counsel for North American Rockwell from 1947 through 1975. Reported by Harriette Cole.

WOLF, AARON ANDREW - a resident of Rolling Hills Estates, CA, died August 31, 2001, after a long illness with cancer. Aaron was a manufacturing engineer for many years at LAD. He is survived by his wife, Norma, also a North American Rockwell retiree. Information from Norma and an obituary in the Daily Breeze.

WOLFE,CHARLES C., 85 - died of natural causes at his home in Grants Pass, OR on October 26, 2001. He worked in the Hydraulics Design Group and Project Group at LAD and retired in 1971. We were notified by a good friend Bob Morse.

THE FASTEST FLIGHT OF THEM ALL

BY DR. RAYMOND L. PUFFER, AIR FORCE FLIGHT TEST CENTER HISTORIAN

On the third of October 1967, Air Force Major William J. "Pete" Knight flew a winged aircraft faster than any human has ever done, before or since. On that day he flew a heavily modified X-15 to a speed of Mach 6.70 (4,520 mph) at an altitude of 102,100 ft.

A joint Air Force/NASA/Navy project to explore the flight characteristics of extremely high speed aircraft (above Mach 5.0) in the atmosphere and at the borders of space, the North American Aviation X-15 program has been described as the most successful flight research program in history. Three X-15s were built, and together they literally bridged the gap between air and space and generated the research data that benefits every Space Shuttle flying today. In so doing, the small black rocket research planes were the first winged aircraft to reach Mach 4.0, 5.0 and 6.0, and established a world altitude record of 354,200 ft.

By the time that Major Knight began to fly the X-15 in September 1965, the design speeds and altitudes had long been reached and the program had entered an exciting new phase. The Number 2 ship had been severely damaged during the course of an emergency landing on Mud Lake, Nevada, on 9 November 1962. NASA's Jack McKay had landed heavily after his engine failed to develop its full thrust; the left landing skid failed completely, throwing the X-15 into a wild skid and causing it to roll over onto its back.

When it came time to rebuild the battered craft, the Air Force and NASA decided to try to reach the full performance potential of the X-15's design --- to modify ship Number 2 to reach speeds considerably higher than were possible in the original configuration. Such a craft might be capable of testing the next big step in aerospace technology, the supersonic combustion ramjet. Accordingly, the second X-15 was modified into a scramjet tester and dubbed the X-15A-2.

The fuselage was lengthened by 28 inches to make room for a spherical tank for the scramjet's fuel. To carry the additional fuel needed for higher speeds, two huge droppable fuel tanks were fitted to the lower fuselage. Air friction at speeds much above Mach 6.0 would weaken even the X-15's chrome-nickel Inconel X skin, so a special resin-and-glass bead ablative coating was developed that would gradually sear away in flight, carrying with it the excess heat. A shocking pink when it was applied, the friable coating was sealed and strengthened with an outer covering of white paint.

The prospect of flying a pink airplane, however, turned out to be the smallest of Major Knight's problems. Fully loaded, the left external tank (liquid oxygen) was 2,000 lbs. heavier than the right (water-alcohol), and he flew that portion of the flight with full right stick. The tanks reduced the plane's static stability as well, making it extremely sensitive in pitch. In addition, residue from the charring ablative material coated the windscreen, restricting his vision.

Now a retired colonel and the State Senator for California's 17th District, Knight recalls his most famous flight. "In essence, we made a three-stage vehicle out of the X-15." The first stage was the B-52 lift to 45,000 ft. The second was the flight on the externals, and the third the high speed dash on internal fuel. "It was probably the most demanding flight I have ever flown, not only from a control standpoint, but from all the emergency procedures necessary to support a tank operation." Knight flew a perfect profile, however, and achieved the objectives for the sortie. That also proved to be the fastest an X- 15 ever flew, although he feels that eventually it could have reached Mach 8.0 if the program had continued.

Knight and his teammates were scarcely concerned about his speed record at the time, however. Records are interesting, and more of them have been set at Edwards AFB than at anywhere else in the world. But the AFFTC's main business has always been flight evaluation and research, and to the professional, performance records are milestones and not goals.

About the author: After earning a BA in Political Science at Michigan State U., Dr. Puffer went on to obtain his MA and PhD in History from the University of New Mexico. A lieutenant in the U.S. Navy Reserve, he served as Nuclear Weapon Officer aboard the USS Saratoga and with the Atomic Weapons Training Group of the Defense Atomic Support Agency. He has been assigned to the U.S.A.F. History Program at Kirkland AFB and Norton AFB and is currently stationed at AFFTC at Edwards AFB. Awards and recognition include Mensa , Air Force Heritage Project Award, Air Force Association Citation and the Air Force Association Medal of Merit. Most important, he is deeply committed to North American Aviation airplanes, especially the P-51 Mustang.



Photo courtesy of the AFFTC History Office

The X-15A-2 secured to the B-52 Carrier Pylon provides a view of the additional fuel tanks



Photo courtesy of the AFFTC History Office

The X-15A-2 at the moment after release from the B-52 Carrier Aircraft

THE TULSA DIVISION MEANS BUSINESS by GENE RICKETTS

The Tulsa Division was established in 1962 with its headquarters located in the Air Force Airport Facility, which it shared with McDonnell-Douglas. The selection of the city of Tulsa as the site for the division, because it was an outstanding progressive community, centrally located in the country with skilled and well-educated labor force and good transportation availability, proved to be an excellent choice.

*The division was set up as an independent production facility with research and engineering capability. Since it relied primarily on subcontract work from other divisions and companies, the scramble for new business was always fierce, including trying to outbid the very same divisions it previously supported. Hence, the slogan adopted by the employees ---**THE TULSA TEAM MEANS BUSINESS** --- prospered with the test of time..*

The division consisted of five separate locations situated on 504 acres of land and 1,500,000 sq. ft. of facilities and employing nearly 4000 people. The Air Force Airport Facility consisted of the executive offices, engineering, research and development which was heavily committed to composites, support functions, major machining, sheet metal fabrication, composites, large major assembly components and flight test. Nondestructive quality control techniques in support of all facilities included ultrasonic, radiographic, penetrate, eddy current, holographic interferometric methods as well as conventional and NC inspection.

Development activities in the laboratories included ferrous and nonferrous metallurgy, cryogenic insulation, electro forming, corrosion control, metal joining, composites and stealth material analysis including an echoic test chambers.

A hazardous test site and a 3000-ft. radar reflectivity range for testing stealth materials was located at the Vidigris River location which also provided waterfront shipping capability. The assets in composite capability provided an advantage in very specialized market opportunities.

The Mingo Facility was primarily dedicated to commercial subcontract warehousing and major assembly. The Sheridan Facility housed purchasing, warehousing and first cut operations on materials.

Finally, the McAlister Plant, south of Tulsa in McAlister, OK was established for electrical, tubing and small parts fabrication in support of the Tulsa and other divisions within the company It was first set up as a separate division under Plant Manager Tom Regan and later transferred to the Tulsa Division.

* * * * * * * * *

By the time I arrived from the Los Angeles Division in Mid-1968 to accept the position of Director of Manufacturing, THE TULSA TEAM MEANS BUSINESS concept was well established under the leadership of President Dick Walker and Harry Todd.

With approximately 4000 employees at its peak, the division was assisting with or designing and building the Apollo Service Module, the Spacecraft LM Adapter, the Instrument Unit and the Forward Skirt, Saturn Thrust Structure, Center Engine Beam and the Aft Inter-Stage Assembly as part of the Apollo-Saturn Programs. Concurrently, Tulsa Division was responsible for the design and assembly of more than 800 units of Ground Support Equipment (GSE) for these programs.

The modification and upgrading (IRAN) of *353* Hound Dog missiles was another major program with a delivery schedule of one missile per day. A point of interest, just before I left LAD for Tulsa, Lee Atwood came to me and said, "Gene, we have a production problem with the IRAN program. The Air Force is one of our most valued customers. We may lose some money on the contract, but of most importance, we need to maintain our reputation with this customer." Those were certainly words of motivation and reflected the attitude of our Company!

Manufacturing Manager Jack Kirkland and Don Bonhardt, Director of Quality Control, teamed up with Bill Wilborn's Program Management team and recovered the program to the delivery schedule of one per day, maintained the schedule, and even made a profit on the program. It was a great tribute to the Tulsa Team. A goal of Air Force Customer satisfaction was accomplished.

Dick Walker left the division a few months after I arrived and Harry Todd became president of the division. Harry Todd's flat organization structure of thirteen direct reports was very challenging and required a great deal of coordination to locate the support where it was needed. After several months, Harry announced a new concept of four Cost Centers for control of the resources for the division with Engineering and Research under Ken Kleinwachter, Material under Ben Pifer, Finance (G&A) under Gordon Suess and Operations under me. Innovative Harry told me that I, with all of the directors and managers under Operations, could decide how much of each organization is needed to meet operations requirements.

This was probably one of my greatest career experiences. It was amazing how communications changed and how productive the process was as we made decisions around a common set of objectives. This became very important as the NASA and DOD hardware phased out and we were bidding on both government and firm fixed-price commercial programs. These reductions were critical to control the direct and overhead rates. This was an example of how flexible, responsive and results oriented Harry and the Tulsa Team were.



Photo from Gene Ricketts Collection

PART OF THE TULSA TEAM REVIEWING A RESPONSE TO A PROPOSAL TO MANUFACTURE BONDED AND STRUCTURALCOMPONENTS FOR THE MCDONNELL DOUGLAS DC-10 AIRCRAFT.

IN FRONT IS PRESIDENT HARRY TODD AND LEFT TO RIGHT ARE GENE RICKETTS, DIRECTOR OF MANUFACTURING; KEN KLEINWACHTER, DIRECTOR OF ENGINEERING: DON BONHARD DIRECTOR OF QUALITY CONTROL; TOM HENSLEY, DIRECTOR OF FACILITIES AND INDUSTRIAL ENGINEERING; GUY CHAMBERS, DIRECTOR OF PLANNING AND GORDON SUESS, DIRECTOR OF FINANCE. NOT IN PICTURE LLOYD JACKSON, PROGRAM MANAGER, MAJOR SUBCONTRACTS

TULSA DIVISION - page 9

The Tulsa Team was very progressive in many other cost reduction programs. These included drilling and automatic riveting techniques, an assembly line approach to NC (Numerical Control) machining of leading edge ribs, NC routing of sheet metal parts and NC inspection techniques. We were pioneering many of these methods with good cost saving results.

Harry left the Tulsa Division at the end of 1970 to head up the Industrial and Marine Division. In January 1971, Bill Cecka moved from his position as VP and General Manager of the Rocketdyne Solid Rocket Division in Waco, Texas to become President of the Tulsa Division. Bill reorganized management to a more conventional structure and I became Director of Operations. My previous experience as the Operations Cost Manager was very valuable and I always appreciated the lessons I learned from Harry Todd. Bill followed through with the tasks of a decreasing workload and had the challenge of trying to acquire new work for the division.

After the phase out of the Apollo, Saturn and Hound Dog programs, the next major concentration was to determine how we could capture enough business to maintain our overhead rate structure and retain a good direct employment base. We managed to capture a few programs involving tooling, machine parts and even some large phased array radar base structures for battleships. We also bid on many other programs including an aluminum welded upper deck ship structure for Litton Shipbuilding in Mississippi. If we were successful, we would build a facility on the Verdigris River Site and transport the structures by barge from our waterfront site to Mississippi. We also worked with the B-1 Division on metal and composite structures that could best be built at Tulsa for the B-1 Test Aircraft program.

As programs were phasing out, we consolidated the warehouse activities back into the Airport Facility and closed the Sheridan Facility, reducing our functional usage to 1,100,000 sq. ft. and 341 acres.



Photo from Gene Ricketts Collection

The Boeing 747 Program Contract signing included: (Left to Right) Lloyd Jackson, Program manager; Bill Cecka, President; Bruce Gissing, Boeing Director of Purchasing and Gene Riocketts, Director of Operations

Ralph Ruud, Corporate VP of Operations, came to visit Tulsa in late January 1972 and toured the facility. Ralph made frequent trips to Tulsa and was always helpful and understanding with any issues or new techniques. On his way to the airplane for his return to Los Angeles, Ralph asked, "Gene, do you have a replacement for your job?" I responded, "Yes, Jack Kirkland." To which Ralph replied, "How soon can you move to California?" One week later, I was on my way to become Director of Manufacturing for the B-1 Test Program.

After a couple years on the B-1 Test Program at Los Angeles and three years at Rohr Industries, I returned to the B-1 Division in February 1977 as VP of Operations under Buz Hello. On June 30, 1977, President Carter cancelled the B-1. In August 1978, Bill Cecka announced his retirement and I was asked if I would like to return to Tulsa as VP and General Manager of the Tulsa Division. I always had a high regard for Tulsa and the Tulsa Team and I readily accepted the offer. I also knew that my contacts and experience at Rohr would be helpful at Tulsa. I would still be working for Buz Hello, President of Aircraft Group, which included Los Angeles, Palmdale, Columbus and Tulsa.
While much of the Tulsa Division was essentially the same, the second tour would include more outside activity with community leaders, customer visitations and company interfaces. The division relied heavily on the B-1 program. After cancellation, there were no major subcontracts on the horizon! The program managers and I spent considerable time in marketing and proposal activity. The composite bonding design and fabrication, stealth composites and metal to metal bonding capabilities provided good leads to opportunities within the corporation and the aerospace market place. We were successful in getting a variety of small fixed price contracts for both Tulsa and McAlester, but these were very competitive and it was tough to support the overhead due to small profit margins.

While getting just enough work to keep a nucleus on board, we were under constant pressure from Boeing due to an increase in our overhead rates. We missed an opportunity to capture a piece of the Boeing 767 Program, since the Los Angeles Division was bidding on it. So we set our sights on the two Main Body Sections of the Boeing 757 Program. The Tulsa Team went all out on these large proposal packages. The Corporate Office financial and facility teams and Buz Hello were very helpful in backing our proposal and facility expansion plans, which included new processing, paint and assembly buildings at Mingo. The city was also helpful in our acquisition of additional land for the new facilities and in compliance with environmental and airport transportation requirements between facilities. This was the shot in the arm the division needed to increase our long range employment and to make us competitive for more work to utilize all of our capability and capacity.

The Boeing 747 Program was already the prime product and performing well. A new challenge would be to bring the 757 Program on line without impacting the 747 Program. The win of the Sikorsky CH-53E helicopter structures contract brought more work for Tulsa and McAlester and also had to be accommodated. The Boeing *757* Program win filled a definite long term need for the division. The entire Tulsa Team was impacted by the sheer volume of this task. Early problems surfaced with the Boeing Computer Design Configuration Model. It became evident that design configuration was going to be difficult. This direct computer release concept was new to Boeing for subcontract work and also for us. The schedule was impacted by the continual engineering and manufacturing change requests, which resulted in considerable scrapping of detail parts and rework of assemblies. Most of this was not too unusual for a new program and it took time **to** work through this period.

We were stretched to our limit in all functions and we and the Boeing Company were very concerned. Our greatest problem resulted in compression of remaining time **to** ship on schedule while confronted with part shortages and a spiking of manpower requirements. My experience with the Boeing Company on the 747 Program at Tulsa and other programs at Rohr Industries and the Los Angeles Division had always been very good. The Boeing Company people were very demanding but when a problem arose they were there with outstanding talent **to** help. The 757 Program was a long range commitment, and like the 747 Program, it required patience with the product and the customer to work through all these challenges.

At the critical time when the first 757 assemblies were being completed; Wally Fore, Corporate VP of North American Space Operations, retired and I was asked to replace him. For me it was a very difficult decision to make. I wanted the job! But, I liked Tulsa and the Tulsa Team and I had ajob to finish. I knew what had **to** be done and I wanted to finish what we had started. Boeing was a valued customer and I felt the commitment to deliver was mine. I left with the feeling of a job not completed

It was soon evident that the internal interest of the Aircraft Group was shifting **to** the B-1, which due to the outstanding dedication by Buz Hello was gearing up for a restart go-ahead by President Reagan. Boeing was not happy with my departure but I knew that the Company commitment was simply not there! It was planned that the Tulsa Division expend much of its resources on the B-1. The contract was later returned to the Boeing Company and the facility was rearranged to support the B-1 Division.

The Tulsa Team did a great job on the B-1 production hardware they designed, built and delivered to Palmdale. I was appreciative of their outstanding performance and reliable support. I shall always remember the six wonderful and productive years that I was a member of the Tulsa Team and I am sure that they continue to be a strong asset to the Boeing Company. I wish them continued success.

About the Author: E. H "Gene" Ricketts began his career at the Los Angeles Division of NAA in February 1941 after high school in Dubuque, IA and graduation from the Aero Industries Technical Institute in Burbank, CA. Following three years in assembly of the B-25 and two years in the US Army Air Corp, he returned to NAA as a mechanic in Experimental. Working on new programs from start-up to test or production, his work included the F-82, FJ-1, F-86, F-100, and the C-5 Proposal with McDonnell-Douglas, followed by the X-15, F-108 Proposal, B-70, SST Proposal and many experimental projects. Gene spent over three years in the Tulsa Division and returned to Los Angeles to head Manufacturing on the B-1 Test Program.

After a hectic series of assignments which included over two years as General Manager of the Tulsa Division, he returned to the West Coast to head up B-I operations at Los Angeles and Palmdale. Gene retired in 1985. Among his many awards he is very proud of the Silver Knight of Management award presented by the Tulsa Chapter of the NMA for the Tulsa Team performance. Gene and his wife, Bonnie, currently reside in Vista, CA.

F-86F GUN EVALUATION IN KOREA By JOHN L. HENDERSON

North American Aviation built a great day fighter aircraft when the XP-86 took to the air and when the re-designated F-86A. E and F models were delivered to the US Air Force. They quickly proved their value in the skies over the Korean Peninsula by establishing and maintaining air supremacy over the Communists that started an undeclared war in 1950.

But the first USAF pilots in combat did not like the .50-caliber machine guns that were to be the standard gunnery system for all F-86 day fighters. They believed the guns to be less than lethal against the Soviet-built MiG-15 armed with cannons and were successful in convincing Headquarters USAF to authorize a gun evaluation by rearming and sending F-86s into combat with cannons.

It was known as Project GUNVAL. The Los Angeles Division modified Ten F-86s and eight were shipped to Korea. Much was learned from this project. Some was not so favorable and more that provided empirical data for future armament installations that benefited the free world aviation industry. These eight upgraded and system improved fighters were on a parity with the MiG-15bis, the best that the Soviet Air Force, or VVS, sent into combat in Korea.

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The P-86 day fighter design specified by the United States Army Air Force (USAAF) in 1945 contained a contractual requirement that all F-86 day fighters be armed with .50-caliber machine guns. This requirement was based on World War II statistics that established the .50-caliber heavy machine gun, or HMG, as the weapon of choice because of its high rate of fire.

During World War II, the United States had failed to develop or to adopt a foreign made automatic heavy caliber cannon with a conventional recoil design because of the slow rate of fire and low muzzle velocity. With the short time on target to aim and fire, American pilots preferred the awesome weight of fire generated by a battery of HMGs. This approach prevailed and carried over to the next generation of fighters — the jets.

There were a few exceptions, namely, the P-39, P-38, P-61 and our first jet fighter, the P-59, that were armed with a mixed battery of light and heavy caliber weapons as some of the foreign air forces had done in an attempt to improve their "kill" potential.

In 1950, equipped with first production F-86A-5 Sabres armed with standard .50-caliber HMGs, the 4th Fighter-Interceptor Wing was deployed to the Far East Command. Soviet Bloc pilots flying the first production MiG-15 (SV) armed with one 37 mm heavy cannon and two 23 mm medium cannons challenged the 4th Fighter pilots. The preferred system for shooting down bombers, the MiG pilots fired a heavy explosive projectile from the 37 mm cannon that was deadly when accurately aimed.

Although the F-86A and the MiG-15 (SV) appeared to be comparable except for the armament, the MiG-15 (SV) was 3,000 lbs. lighter, giving it a faster rate of climb and a ceiling of 50,000 feet compared to 48,000 feet for the Sabre The American pilots also perceived the heavy cannon explosive projectile, albeit delivered at a decidedly slow rate, to also favor the MiG-15 pilot. However, neither the F-86A nor the MiG- 15 (SV) and subsequent MiG-15 bis model had a gunnery system totally suitable for combat between transonic jet fighters.

The newly independent and reorganized United States Air Force recognized the F-86A lack of armament parity with the MiG-15 and the need to evaluate the armament of all fighters in the inventory. In late 1951, this led to a classified F-86 cannon project designated as Project GUNVAL. North American Aviation was contracted to modify ten selected aircraft, four F-86E-10s and six F-86F- Is, and deliver them to Air Research and Development Command (ARDC) in 1952. The aircraft were to be rearmed, powered by the J47-GE-27 jet engine with 6090 lbs. military thrust and fitted with the "6-3" hard leading edge wing outer panels for improved flying capability above 35,000 feet.

LAD's George Bussiere's Armament Engineering Group had the major task to design a Mauser 20 mm gunnery system to fit in the enlarged and reinforced gun bays with two T-1 60 prototype cannons in each bay. It was a case of placing 10 lbs. in a 5 lb. bag but Paul Peterson and his Armament Engineering Fixed Gun staff managed to get it done. After refining the prototype guns to a reliable operational configuration and designing the 20 mm gunnery system to fire 40,000 rounds for gun operation and airframe structural reliability, they modified the ten project aircraft and delivered to the Air Force on schedule.

Eight of the ten modified Sabres, re-designated as F-86F-2s to reflect the Mauser 20 mm armament, were sent to Korea in December 1952. As part of the civilian support personnel, Paul Peterson went with them. The project stability testing period was to last 16 weeks from January through April 1953.

The eight GUNVAL aircraft carried the same improved fire control system, i.e. A-4 gun sight and ANIAPG —30 ranging radar equipment to aim and fire the heavy caliber guns as did the later versions of the F-86Fs armed with six fifties firing 1100 rounds per minute.

The Air Proving Ground Command (APGC) GUNVAL detachment of 21 personnel from Eglin AFB --- five pilots, one ordnance officer, eleven armorers and four civilians ---set up shop on the 4th Wing flight line at Kimpo Air Base, northwest of the capitol city of Seoul the first week of 1953. Twenty base maintenance personnel joined them in maintaining and flying the cannon armed Sabres.

When then F-86F-2 GUNVAL aircraft, attached to the 335th Squadron of the 4th Wing started flying combat missions from Kimpo Air Base, they lost their first modified Sabre due to a flameout of the engine at altitude during firing of the four 20 mm cannon. Failure was originally considered an unknown phenomenon until extensive non-combat test flying proved the failure to be ingestion of gun gas into the engine intake causing the flameout. The pilot failed to air start the engine and ejected over the waters of the Yellow Sea and was rescued. Thus, the gun gas ingestion caused the loss of a good airplane. The gun gas issue caused numerous flameouts that delayed the project but did not cause loss of another aircraft.

A second loss occurred on the last day of the project flying in April. This time it was an engine failure when the engine turbine wheel failed and took out part of the aft fuselage. The pilot managed to glide over the Yellow Sea, eject and be rescued. By this time Paul Peterson had solved the gun gas ingestion issue. A modification in the form of a deflector had been welded on the gas blast ports to force the gun gases away from the flight path.

For the short period of winter operational flying and further shortened by non-operational days due to weather and the engine flameout problem, the GUNVAL project scored in the air and delivered the necessary evaluation data required for the decision makers at higher headquarters.

Although radically rearmed and rushed into combat without total evaluation of the 20 mm gunnery system at the higher altitudes, the F-86F day fighters were the first that were on a parity, system wise, with the MiG-15bis. The conspicuous fact is written into the records, the F-86 pilot — six gun weapon combinations was far superior to the MiGs in air-to-air combat.

A total of 307 combat sorties were flown to MiG Alley with 4th Fighter Group missions. The GUNVAL pilots sighted MiG-15s on 139 occasions, engaged and fired on 41 enemy aircraft. 20 mm hits with high energy incendiary (HEI) and armor piercing incendiary (API) rounds were scored on twenty-two MiGs; 6 for confirmed victories, 4 probably destroyed and 12 damaged.

Two conditions set back the operational suitability of Project GUNVAL: Engine compressor stalls followed by flameout and, midway through the project, pilots were limited to firing two guns above 35,000 feet.

In spite of these problems, Fifth Air Force reported that there was a higher percentage of enemy aircraft destroyed or damaged per mission flown than the overall 5th AF average, The report continued to say that the percentage could probably be attributed to the flying skills and experience of the dedicated "test" pilots. It concluded that the GIJNVAL installation was not suitable for combat, due to the 4 second limited time of fire (115 rounds per gun with a rate of 1500 rounds per minute).

However, the reliability, high cyclic rate, and 3000 feet per second muzzle velocity indicated the gun was potentially a weapon for future fighters. It was installed in the F-86H, F-86K and F-100, Chance Vought F-8U, McDonnell F-101, Lockheed F-104, and the British Hawker Hunter as the M39. On some of these airplanes, the gun gas ingestion problem had to be resolved by the fix used in Korea on the F-86F-2 cannon Sabres.

Paul Peterson and his engineering group designed, perfected and patented the deflector/baffle device in various configurations dependent upon the gun muzzle location to the engine air intake duct. Project GUNVAL research and documentation was not completed and finalized until 1957..



Photo from Paul Peterson Collection

The only Project GUNVAL F-86F Sabre known to be intact is located on display in front of the Colorado National Guard Headquarters, Buckley ANG Base outside of Denver. Aircraft AF51-2884 was one of two airplanes delivered to Eglin AFB for APGC pilot test flight. The plane was subsequently loaned to NAA in April 1953 for test flight after the engine flameout issue was resolved.

F-86F Gun Evaluation—page 11

Aircraft AF51-2803 being fitted with cannon installation by project engineer Robbie Robertson (person standing not identified) as part of the Project GUNVAL testing at LAD in summer 1952. Aircraft was subsequently lost in August 1953 due to engine failure during combat mission over Korea. The pilot ejected and was rescued.



Photo from Paul Peterson Collection



Photo Courtesy of Boeing Historical Archives

A Cutaway View of the F-86F Sabre illustrating the T-160 20 mm Gun Installation.

About the author

John L. Henderson served four years in the Army Air Force Technical Training Command before being hired by NAA in 1946. He became a leadsman-crew chief in Production on the Navy FJ-1 Fury and then the F-86A day fighter. Transferred to Field Service, he became a tech rep in support of the newly equipped F-86A squadrons. Assigned to the 1st Fighter Group and then to the 4th Fighter Group at Langley AFB in Virginia, he spent 30 months with the 4th, including 13 months in Korea. He was the first F-86 rep in Korea participating in support of the first air-to-air engagements between the Soviet built MiG-15 and the F-86 Sabre during December 1950. Subsequent assignments included the Navy XFJ-2 carrier qualification project, a short tour at Eglin AFB with the Air Force Armament Center on the GUNVAL Project and the California Air National Guard. John resides with his wife, Barbara, in Ventura, California.

Dear Ed
The article ***"Nothing but the Facts"*** by Sam Iacobellis not only aroused my sympathy regarding arbitrary disarmament measures by our government but directed my attention to a related matter.
With no fanfare and almost zero press attention, the United States on August 24th blew up the last MINUTEMAN III missile silo scheduled for destruction under the Strategic Arms Reduction Treaty (START 1).
The silo, located at Grand Forks Air Force Base, once housed an intercontinental ballistic guided missile equipped with nuclear warheads and an Autonetics-built Inertial Guidance System, was destroyed and sealed with 800 pounds of explosive.
START 1 was signed in 1991 by Soviet leader Mikhail Gorbachev and former President George Bush and took effect in December 1994. The destruction of America's missile silos began on October 29, 1995, when Russian Defense Minister Pavel Grachev detonated a charge that demolished a MINUTEMAN missile silo about 65 miles from Kansas City.
"The first foreigner to blow up a U.S. missile silo is the minister of defense of Russia, how about that?" an elated Grachev crowed. William Perry, then-President Clinton's secretary of defense, who also participated in that 1995 event, described it as an "act of great symbolic significance."
So is the destruction of the World Trade Center Twin Towers.

Sincerely, Frank M Pelteson, Las Vegas, NV

Dear Ed,

I would like to add to the fine article HOW THE BEST WAS WON by "Buz" Hello. A significant part of the effort to "Keep a Core Team" together was the Engineering Loan Program later known as the T & M.
This program began in the Structures Department under Dr. George Haviland with the loan of stress engineers to Boeing and Douglas. At its peak, the program had over 1000 engineers and others loaned out to Boeing, Douglas, Lockheed, and Northrop as well as Canadair. Milo Olsen later took over the direction of this program and was in charge to its completion.
I understand that when the USAF asked, "Where are the engineers coming from for a restart?" one of the answers was from the T & M effort.
I would also like to say that we all owe a great deal of gratitude to those engineers and others who volunteered to spend months away from their homes and families to work on this loan program.

Cordially, Nelson Wong, Irvine, CA

Dear Ed,

I worked at NAA from August 1940 until September 1944 when I left to join the U. S. Army, just in time to arrive in Europe for the "Battle of the Bulge".
I worked in Department 1, under Earl Gardiner and held Badge #745. Your article on the B-25H project brought back memories as I was in the plant the evening of the ill-fated crash. I saw the last few seconds of the flight as it exploded over the east parking lot. It certainly was a tragedy.

One of the "Old Gang", Paul R. Struck, Santa Ana, CA

Dear Ed

Enclosed find a check to extend my subscription. I am an old timer that started working at North American Aviation on October 1, 1940. My employee number was 00032. My entire working years were in the Flight Test Department.
I was especially interested in the article by Norm Avery about the B-25 since I worked on the aircraft. I also saw its demise when I witnessed the wings come off during a high-speed pass while we were waiting for its return to give it a post-flight inspection.
I retired on September 1, 1981 when President Carter cut the funding on the B-1A program.

Cordially, Walter E Joyce, Gulfport, MS

Dear Ed,

I started working for NAA at the Long Beach plant in 1948 on the B-45 and when that closed I went to LAD on the F-86D final assembly and flight line operations.
Transferred to Fresno in 1954 on the F-86D modification and refit of F-86Fs from Korea and when Fresno closed I returned to Downey and then Anaheim on Minuteman. After that, back to Downey on Apollo, then back to LAD and the Sabreliner. Ended on the B-1B and retired in 1972.

Cordially, Bill Dooley, Las Vegas, NV

Dear Ed,

I've been so impressed with your performance and perseverance during these last years to continue the information flow. Please accept my contribution of $100.00 to be identified with the Silver Eagles.

My career at NAA began in 1953 after several years at McDonnell Aircraft and Bell Aircraft in flight test operations. My first NAA assignment was at the F-86H Flight Test Operations, in the old Volitan hangar at Palmdale - the place where "Wheaties" in a demonstration flight for the press with the new F-100 managed to break all the glass windows out of the airport office and terrify approximately 40 reporters who were there for the demonstration. Neal Scott and I were finally able to get on his radio frequency in order to slow him down so the shock wave would not do any more damage. It was a fantastic demo and luckily the flying glass hurt no one.

After that start and learning how to report aircraft performance problems to Walt Spivak, I went on to the F-107, X-15, Apollo, F-111 Avionics and the B-1 program. All had their own set of problems but the community of NAA talent was always up to the task.

It was hard work but fun -THANKS FOR THE MEMORIES !!!

Quinton (Q. *C.) Harvey, Fallbrook. CA*

BALD EAGLES ANNUAL REUNION

The 40th Annual Bald Eagles Reunion will be held on Saturday, April 13, 2002 at the Proud Bird Restaurant, 11022 Aviation Blvd. (At 111th Street).

Doors open at 10:00 AM for social hours. Seating for lunch is 12:00 noon.

Please send your check for $20.00 payable to Bald Eagles, Inc. and mail to:

Val Yarbrough
520 Del Oro Drive
Ojai, CA 93023-1805
Tel: 805-646-2283

Include with your check the name, you wish to have on the badge, and the name of each guests for whom you are ordering a ticket. Tickets and badges will be issued as you register at the entrance.

Cancellation notices must be received by the treasurer before March 25, 2002. There will be no refunds after the deadline.

There is no service requirement to attend the reunion — just an interest in North American Aviation/Rockwell.

Parking is limited — Car pooling and early arrival is encouraged.

NORTH AMERICAN AVIATION RETIREES BULLTIN
2600 WESTMINSTER BLVD.
PO BOX 3644, M/C SJ5
SEAL BEACH, CA 90740-7644

MEMBERSHIP FORM

Yes, I am a retiree of NAA/Rockwell and I want to be a Member and receive the NAA Retirees Bulletin, I am enclosing a check payable to: **NAA Retirees Bulletin**. for $ _____ Note on Check: For NAAR Bulletin. For every $10.00, I will receive four issues.

NEW SUBSCRIPTION_____ RENEWAL SUBSCRIPTION _____

Name: _____
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You may also send a gift subscription to another NAA retiree. Just give us the name and address of the recipient along with your payment (check payable to: **NAA Retirees Bulletin)** and we will send a gift card to him/her. For every $10 - gift recipient will receive 4 issues.

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After:_____ Years of service

NEW GIFT SUBSCRIPTION_____ RENEWAL GIFT SUBSCRIPTION _____

Name: _____
Street Address: _____
City/State/Zip: _____
Retired from: _____
After:_____ Years of service



Photo: NAA Skyline, 1941

WOLF, CARLTON HUE, SR. - passed away in Vista. CA, on September 3,2001, according to an obituary in the Pacific Palisades Post sent in by Chan King. Carl came to California with the North American move in November in 1935. He specialized in Wing Design and headed that group in engineering. He was assigned to the new Kansas City Division as Division Engineer in 1941 and returned to the Los Angeles Division in 1945 at the end of WWII. He was a key designer in all of the early North American airplanes and a charter member of the Bald Eagles.

ALDRICH, ORIEN, 76 - died of a stroke on November 11, 2001 in Fullerton, CA. Orien worked as an engineer at Rockwell International. Information from a newspaper obituary sent by Maxine Haun.

ALLEN, MAXINE, 76 -died October 1. 2001, of a heart attack in Anaheim, CA. She worked at Rockwell International for 36 years in Downey and Anaheim. Information from an obituary sent in by Maxine Haun and a letter from her daughter, Christine Fuller.

AMEER, GEORGE ALBERT, 70 - of Santa Ana, CA, an optical physicist in Boeing's Aerospace Division, died September 13, 2001, of pulmonary hypertension. Information from an obituary in a local newspaper.

BAKER, GERALDINE, CECILIA, 56 - an administrative assistant for Rockwell International. died October 13. 2001. of adult respiratory syndrome after suffering with Lupus for many years.. Geraldine worked at LAD in Major Subcontracts as a secretary. Information from an obituary sent in by Maxine Haun and reported by Diana (Hodgert) Arceri.

BARTON, B. E. (DICK), 80 - retired Public Relations Director, Space Division, died peacefully in his sleep at a rest home in Victorville. CA, on October 5, 2001. Dick joined North American's Public Relations Department in *1952* and returned to Rockwell's Space Division, where he worked on the Apollo and Space Shuttle Programs until his retirement in 1988. Reported by Earl Blount and Ed Rusinek.

BERRY, DONALD J., 66 - passed away on September 28, 2001 after a five month battle with cancer. He retired to Palm Desert, CA after a 30 year career in aerospace procurement and management which included the Apollo, Space Shuttle and GPS programs. We were informed by his neighbor Al Ferguson.

BERRY, HAROLD F., 87 - passed away October 8, 2001. Harold was a long time resident of the South Bay and a NAA/Rockwell employee in manufacturing management in Production Control/Scheduling. Information from the Daily Breeze.

BJORNSON, WALLACE E., 84 - of Laguna Woods, CA died October 9, 2001, of pneumonia. Information from an obituary sent in by Maxine Haun.

BLAMER, JOHN WILLIAM, 85 - passed away on October 10, 2001, in Anaheim, CA. He was a retired engineer from North American Aviation. Information from an obituary sent in by Maxine Haun.

BLEA, LUCILE - passed away October *5,* 2001, in Escondido, CA. Lucile was a long time employee in D/50 Planning and Experimental Planning. We were notified by Hazel Arruda and Rex Tabor.

BLOUGH, ROBERT A., 80 - passed away on October 25, 2001 in Woodland Hills, CA. He retired from Rockwell International in LA Division. We were notified from a newspaper obit sent in by Joe Pirzynski.

BINGGELI, EDWIN G., 80 -- died October 7, 2001 in Los Angeles, CA. He worked at NAA for 30 years as a jig and tool builder on the Space Shuttle, X-15 and B-1 bomber. Information from an newspaper obit sent in by Joe Pirzynski.

BROWN, ROBERT SEYMOUR, 73 - passed away September 24, 2001, in Lancaster, CA. He started with North American Aviation in the '60's and retired from Boeing in 1989. Upon retirement he enjoyed volunteering for Santa's workshop which provides toys for under-privileged children. Information from an obituary sent in by Joe Lovenduski. Lancaster, CA.

CARROWAY, CARL R., 88 - from Tustin, CA, died on September 9, 2001. Carl was a general foreman at the Downey facility. Reported by his son-in-law, Arthur Moon.

DAIGNEAULT, ARMAND M., 75 - November 3, 2001 in Hemet, CA. He was an electrician at North American Rockwell in LA Division for 30 years. We were notified from a newspaper obit sent by Gene Somers.

DARBY, VENE LEONARD, 83 - passed away October *5,* 2001, in Kentucky. Vene was an engineer involved in the development of superplastic forming of titanium. Several patents were granted to him in regard to structural aircraft design. We were notified by Ronald L. Conlon who sent in an obituary from the Daily Breeze.

DAVIS, AUDREY, 82 - passed away from high blood pressure and heart failure on August 16, 2001. Audrey worked for the company for over 30 years. We were notified by Virginia H. Dennis. Henderson, NV.

FITCH, GEORGE E., - passed away November 17, 2001, in Torrance, CA. After serving as a Navy pilot in WWII, George began his 38-year tenure as an aeronautical engineer for Rockwell International, playing an integral part in the design of the X-15 and the B-1. Information from an obituary from a local paper sent in by John Koblosh.

FREGOSO, OLIVIA E. - of Escondido, died of diabetes complication on October 21, 2001. She worked for Rockwell International in Anaheim as an assembly line supervisor. Information obtained from a newspaper obit sent by Maxine Haun.

GRAHAM, C. J. (CHUCK), 78 - died of natural causes in Cocoa. Florida. A 40-year employee of the company. he retired in 1988. Chuck was a former test pilot and Customer Relations Executive. He flight-tested F-86 and F-100 Supersonic Sabres and had been named an honorary member of the"Doolittle Raiders" by its commander, General Jimmy Doolittle, who led the famous raid on Tokyo, Japan, April, 1942. We were notified by Earl Blount.

GREEN, RUE "BUD", 84 - died November 8, 2001 in Hemet, CA. He was an aerospace engineer, most recently at Rockwell International. He served in the U.S. Navy during World War II and was a survivor of the Pearl Harbor attack. We were notified from a newspaper obit sent in by Gene Somers and Gene Logolin.

HOWARD, BEULAH J., 76 - died on November 11, 2001 at her home in Hemet, CA. She was an electrical assembler at Rockwell international for six years. Information from an obituary sent by Gene Somers.

HUBERT, ANTONE CHARLES, 87 - died in September at his home in Sun City, CA. He was a mechanical engineer for 30 years for North American Rockwell. retiring from Seal Beach. Information from an obituary sent in by Mrs. G. M. Preston, Canyon Lake, CA.

INCE, DANIEL B. (DAN) - passed away on September 5, 2001. in Redondo Beach. CA. Dan worked in Engineering Flight Test for 38 years and retired in 1980 as Director of Instrumentation. We were notified by Arch Forman. Rolling Hills Estates. CA.

IRWIN, WALTER L., 71 - of Lake Forest. CA, died September 9, 2001, of heart disease. Information from an obituary from an Orange County paper.

IVVENS, DONALD A., 85 - died of congestive heart failure in Yorba Linda, CA on November 13, 2001. Don was an engineer at Rockwell International. Information from a newspaper obituary sent by Maxine Haun.

KODIS, RICHARD DAVIS - died September 14. 2001, in Orange, CA, of cancer. Richard was an engineer at Rockwell International for 32 years. We were notified by Joe Pirzynski. Inglewood, CA.

KRAFF, RAYMOND E., 76 - passed away October 6, 2001, in Escondido, CA. Ray retired from Downey as a training specialist.

LAMBERT, RALPH, 69 - of Huntington Beach, a retired engineer from Rockwell, died August 31,.2001, of congestive heart failure. Information from an obituary in a local paper.

LARY, FRANK, 84 - passed away in early August, 2001. Frank was an aeronautical engineer and held many managerial positions in Los Angeles and Rocketdyne. We were notified his son, Steve Lary.

LE MAY, FREDERICK D., 74 - died on October 25, 2001 at his home in California City, CA. He worked at Atomics International, Rocketdyne and the B-1 plant in Palmdale as a senior industrial engineer. We were notified by Joe Lovenduski from an obit notice in a local newspaper.

LITTLE, RITA W., 73 - passed away on September 17, 2001, in New Castle, OK. Rita worked for Bill Gray in PDL for 25 years. We were notified by her husband, Austin Little.

LOCKWOOD, PHYLLIS, 72 - of Anaheim, CA, an electronic technician for Rockwell International, died September 23, 2001, of lung cancer. Information from an obituary in a local paper sent in by Maxine Haun.

LOVIO, ANN A., 77 - of Huntington Beach, CA, passed away on October 24, 2001 of cardiopulmonary arrest. She was a retired inspector from NAA/Rockwell. Information from an obit in a local newspaper.

MALE, RAYMOND E., 81 - from Sun City, CA, died of heart disease on September 25, 2001. Ray worked as a scheduler in Change Control and Configuration Management in LAD and assisted other divisions We were notified by his good friend. Eugene Miles.

MCKAY, NETTIE J., 90 - died September 22, 2001 in Hemet, CA. Her ashes were scattered at sea. She was a mathematician at North American Rockwell in El Segundo. We were notified from a newspaper obit sent in by Gene Somers.

McKEMY, PAUL BRUCE, 84 - passed away from natural causes. He had worked in Quality Control at LAD thru the many models of the F-86's. He also worked at Palmdale, Downey and Rockwell Engineering in Anaheim and retired in 1982. We were notified by Ben Smith who was informed by Paul's wife, Lorraine.

MITCHELL, FRANK DOIG - died September 11, 2001, while residing at St. John of God. He graduated from Stanford University in engineering and worked for Rockwell in the Apollo Space Project and Space Shuttle Program. We were notified by Joe Pirzynski, Inglewood, CA.

OBBEMA, CHARLINE J., 78 - of Buena Park, CA, an assembler for Rockwell International, died September 12. 2001. Information from an obituary from a local paper.

PEPPLER, LOUIS, 86 -- died of heart failure in Palmdale, CA, on September 13, 2001. He was a tool and die maker at LAD for 40 years. We were notified by his daughter, Cheryl Cunningham.

PETERSEN, ALLEN R., 78 - died October 20, 2001, in Hawthorne, CA, after a long battle with diabetes. Pete started at NAA in 1942 and retired after 40 years as a mechanical design engineer in Tool Design. John Gejer notified us.

QUINONES, DON, 71 - Don retired in 1991 after 31 years with North American Rockwell, LAD. He worked in Contract Data Management and Major Subcontracts Control. Norm Martin notified us.

RENTSCH, LESLIE D., "RED", 80 - passed away October 22, 2001, in Lancaster, CA. Red was a 48-year employee with North American and Rockwell. He worked for Quality Control at Palmdale and Edwards Air Force Base. Richard Culleton notified us.

REESE, CLAUDIA, 86 - died on October 24, 2001 of heart failure. She worked as a Design Engineer in the Fuselage Group of LAD. She worked at Consolidated in San Diego prior to coming to NAA. She was also the 1st woman Union President at Consolidated. Val Yarbrough notified us.

SALDATE, TONY- passed away September 7, 2001. in Los Angeles, CA, of heart failure and other complications. Tony worked at Autonetics in Anaheim and on the Space Shuttle Program in Downey and retired in 1991 after 35 plus years. We were notified by Frank O'Leary of Yorba Linda, CA. and Ken Fowler.

SCHMIDT, LLOYD CLAIRE, 67 - a computer designer for Rockwell, died September 12, 2001, of cancer. Information from an obituary in a local paper.

SEXTON, ROBERT E. (BOB), 77 —of Brea, CA, died September 5, 2001, from congestive heart failure. In the 60's, he was manager of the Environmental Control and Life Support Systems for the Apollo Space Capsule. He worked from 1951-1978 for NAA/ Rockwell but took early disability retirement in 1978. Submitted by his wife, Gere Sexton.

SILENT MAJORITY (Continued on page 6)

RETIREES BULLETIN OFFICE
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North American Aviation Retirees Bulletin

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NA-35, A SINGULAR PRIMER TRAINER

Originally, the NA-35 was planned as a company funded project in 1937 and was subsequently shelved. The project was reinstated in 1939 as a prototype/demonstrator to compete for an Army Air Corp contract. Edgar Schmued was the project and design engineer on the airplane. Of all aluminum construction, the NA-35 was built in just 29 days. Powered by a 150 hp Menasco Pirate air-cooled, inverted, in-line engine, it would cruise at 125 mph. Weighing in at 1760 pounds gross, the maximum speed was 150 mph. With a maximum range of just over 300 statute miles, its landing speed was a comfortable 46 mph.



The much hoped for contract did not materialize even though there was considerable interest by foreign governments. NAA became preoccupied with other projects and the NA-35 demonstrator and the design rights were sold to Lockheed's Vega Aircraft Division who built four more of these planes. The government, fearing a shortage of aluminum which never occurred, restricted Vega from going into production of this all metal trainer. The prototype/ demonstrator, Civil Registration No. NX14299 and NAA No. NA-35-419 made its first flight from Mines Field on December 9, 1939 with test pilot Vance Breeze at the controls.

Article by Dick Morley, Tucson, AZ. Photo from NAARB Archives

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION
Retirees Bulletin

Spring 2002

Inside: **HAVING THE BEST JOBS IN THE COMPANY** by Al Martin
A NEW SPECIES OF WARBIRD by Raymond Puffer
THE LEGACIES LEFT BY NORTH AMERICAN AVIATION by John Moore
NORTH AMERICAN AVIATION IN EUROPE – THE COLD WAR by Bob Clark



Photo courtesy of the AFFTC History Office

IN MARCH 1954, A NAVAHO X-10 TURBOJET FLEW AT MACH 1.47 – EASILY OUTPACED THE FASTEST CHASE PLANE AVAILABLE, THE NAA F-100 SUPER SABRE.

NORTH AMERICAN AVIATION
Retirees Bulletin

NAAR BULLETIN, an affiliate of the **Bald Eagles, Inc.**, is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

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DEAR NAA RETIREE BULLETIN SUBSCRIBER

We start the new year with 61 fewer of you due to the Silent Majority and several hundred fewer because you have not resubscribed. We are hoping that the reason you did not is because you were too busy and will get to it later. As your new staff we intend to bring you a quality publication worthy of your respect and enjoyment.

Consequently, we have some great articles in this issue which should bring back a lot of memories because they entail so many of you from all divisions of NAA/Rockwell. Speaking of staff, we have some new members. Stan Guzy is taking over the Silent Majority, Bryan Hori will do all the graphics and layout and Pat McGinnis from Boeing Archives is helping with the old Downey photos still available.

Three of the articles relate back to the Navaho and the X-10. The same events, viewed through different eyes, provide a very interesting sense of history. Al Martin joined the flight test group in Downey as a pilot-engineer developing avionics for the Navaho in the early 1950s when off-the-shelf hardware had not even been invented, much less available. Our historian, Dr. Raymond Puffer, submitted another of his succinct and crisp reports on the preparations at Edwards Air Force Base for the first flight of the Navaho X-10. Again, we have a John Moore providing us a virtual history of NAA in the post-WWII era, much of it starting with the X-10. The word "genius" has been cheapened by its application to so many people that have accomplished trivial things. We will only describe John R. Moore, the first president of Autonetics, as one of the great minds of our time. His report on the events and his participation in them was too good to edit down so we will present it in two segments starting with this issue.

Robert Clark provides us some insights on what it takes to open and operate an office in the field. He was sent to Europe during the Cold War and helped our European allies adapt the F-86 Sabre into their air forces. It wasn't all cocktail parties and air shows. There was a lot of homework and diplomacy needed to assure our customers that NAA products were superior to our competition's wares.

On Wednesday, December 2, 2001, the Los Angeles Times printed a front page article titled **"MALIGNED B-1 BOMBER NOW PROVING ITS WORTH"** which must have stuck like a barb in their liberal editorial craw. After summarizing a litany of criticism from every direction and with forked tongue in cheek, the Times admitted, **"...in an odd twist of faith, the B-1 has become the workhorse of the air campaign in Afghanistan..."** Adding some partisan politics to the controversy, the article stated that the B-1 is a Republican (Party) bomber and the B-2 is a Democratic (Party) bomber. However, undisputed is the fact that the B-1, as an All American bomber, has flown 10% of the missions but has accounted for 70% of the ordnance dropped in Afghanistan.

We understand that the first Saturn S-II reunion has gained wide acceptance with more than a hundred retirees signed up already. After 40 years, it will be a splendid opportunity to tag up with old friends and associates. We congratulate Al Otto for taking on such a grand endeavor with no assurance that he would succeed. But again, he is part of our NAA family and we only play to WIN!

Until our next issue, stay healthy and stand in the shadow of God's Blessing!

ATTENTION RETIREES RESIDING IN NEVADA!

Autonetics retiree Frank Pelteson received about a dozen phone calls from retirees interested in getting together for a periodic social. Some forgot to leave their phone number. If you reside in the Las Vegas area, why not give Frank a call or an e-mail. His number is 1-702-655-1955 or e-mail to FPELTESON@AOL.COM.

COMING IN THE SUMMER ISSUE!

Successful landing and launching of a Mustang P-51D from the deck of the USS Shangri-La (CV-38)

NAA/ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Bill Kelley at (714) 637-9374.

The Antelope Valley Retirees Club meets temporarily in Courson Park at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell/Boeing retirees are welcome. For information, contact Bill "Tiny" Kisler at (661) 273-0213.

Boeing Valley Retirees Club meets on the 3rd Thursday of each month at the Canoga Park Rec Center, 8500 Fallbrook Avenue, Canoga Park, CA. The president is Jennie Muncaster at (818) 341-8919.

"The Old LAD Stress Group" meets for breakfast approximately every two months at Mimi's Cafe in Torrance, CA. If you are from the old LAD Stress Group contact Gene Laxton at (310) 378-3113 or Ed Rosenthal at (310) 375-8933.

"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meet at 11:30 AM on the 2nd Wednesday of the month for lunch at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd. and Mariposa Ave.

The NAA 101 Tooling Retirees Group meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at the Cimarron Cafe, 5160 190th St., West of Anza Avenue in Torrance, CA.

GPS Breakfast Club meets from 6:00 AM to 8:00 AM every Wednesday at the Primrose Restaurant, corner Seal Beach Blvd. and Westminster Blvd. All are invited. For more information, call Fred Shitara at (714) 750-1016.

Seal Beach Retirees Group meets at 11:30 AM on the 3rd Wednesday of the month at "The Fish Co." on Los Alamitos Blvd. at Katella Avenue. For more information call Marvin Blaski at (714) 848-5717 or e-mail to mblaski@aol.com.

The Facilities, Industrial Engineering and Plant Services Retirees Group meets at 11:45 AM on the 2nd Thursday of each month at Buster's (formerly Jolly Roger's) Restaurant in the Long Beach Marina. Contact Joe W. Mausser at (562) 596-5845.

Downey Engineering Group of Retirees known as the "Choir Boys" meets every Thursday for lunch at various restaurants from Downey to Seal Beach. Call Al Risi at (714) 892-5725 for meeting location.

"Ye Olde Pharts Breakfast Club" meets at 10:00 AM on the 4th Thursday each month for breakfast at Polly's Pies at 2025 N. Tustin Avenue in Orange. For information call Don Metzger at (949) 495-5374.

The North American Rockwell Retirees Club of McAlester, OK (a satellite of Tulsa, OK) meets at 10:30 AM on the 3rd Tuesday of every month at the Down Town Meeting Place. Call J. A. Darden at (918) 423-0706 for more information.

Tulsa & McAlester Retirees meet for breakfast at 8:00 AM on the 2nd Monday in March, June, September and December at the Ramada Inn, 8181 East Skelly Drive in Tulsa, OK. Call Harry Phillips at (918) 838-3716.

The North American Rockwell Retirees Group of Columbus, OH Engineers and professionals meet at 11:30 AM on the 3rd Thursday of each month at the Berwick Park House. Contact Byron C. Solomides at (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH meets at Noon on the 1st Monday of the month at the Old Rockwell Park on North Hamilton Road. Contact E. Hamilton at (740) 927-5940 for information.

Autonetics Group including Marine Systems, Program Office, Project Office, System Test, Engineers and Designers meets for lunch on the last Wednesday of each month at the HomeTown Buffet, Rose Avenue and Alta Vista Drive in Placentia, CA. Call Mike Vohs at (714) 762-1925 for more details.

Autonetics Industrial Engineering and Maintenance Retirees meet for lunch on the 1st Thursday of each month at the HomeTown Buffet, 390 McKinley, located in front of the Home Depot, in Corona, CA. For more details, call Don Burt at (909) 698-0072.

Autonetics Flight Control Retirees meet at 11:30 AM on the 3rd Thursday of each month except December at "The Lamppost Pizza House" located at 17568 Yorba Linda Blvd., corner of Richfield Road, in Yorba Linda, CA. Call Jim Anderson at (714) 779-5620 for details.

Autonetics Retirees meet for lunch at 11:45 AM on the 2nd Wednesday of every month, alternating between the Rembrandt Restaurant, 909 E. Yorba Linda Blvd., Placentia, CA and the Yorba Linda Country Club. All Autonetics retirees, spouses and friends are invited. Contact Robert Nease at (714) 971-7870 or e-mail to rfnease@email.msn.com or Ed Venanzi at (714) 779-5652 or e-mail to EdVennz@aol.com.

A Group of NAA Retirees meets for breakfast at 8:15 AM on the 1st Wednesday of each month at Knott's Berry Farm-Chicken Restaurant. All are cordially invited. Contact Maxine Haun at maxa3131@aol.com.

Autonetics Financial Luncheon Group meets for lunch at Noon on the last Wednesday of the month at Carrow's located at 100 N. State College in Fullerton. Contact Ken Cantwell at (714) 970-7171 or Kcantwell@prodigy.net.

A Group of Engineer Mgt. meets at 11:30 AM on the 3rd Tuesday of the month for lunch at Denny's on Imperial Hwy and the 57 Fwy. Call Ed Moran at (562) 697-9949 for information.

NAA Tech Reps Assn. (TRA) Breakfast Club meets at 9:00 AM on the 1st Tuesday of each month at the Carlsbad Airport Restaurant. For more information, call El Presidente Rafael Colunga at (760) 940-0525.

Material Group retirees from Downey and Seal Beach meet at 11:30 AM on the 2nd Wednesday every month at various restaurants. Contact Joan Dominguez at (562) 865-7200 or e-mail to tatedom@aol.com for location.

ANNUAL EVENTS

Bald Eagles Reunion - The 40th Annual Reunion is on Saturday, April 13, 2002. Call President Val Yarbrough at (805) 646-2283.

Grants Pass Picnic - Held the 1st Wednesday after Labor Day, September 4, 2002.

NAA-K B-25 Reunion - Will be held on August 18, 2002. For more information, call Harry J. Desko at (913) 287-7223 or write to him at 3024 N. 47th St., Kansas City, KS 66104.

Flying Horsemen - For the year 2002, the annual reunion will be held on Tuesday through Thursday, September 17th through 19th at Konocti Resort and Spa, Kelseyville, CA. Contact Bob or Linda Morse for reservations at (541) 474-1438 or e-mail to lindabob@internetcds.com.

The Hangar Gang - This group of retirees meets approximately every 6 months. For time, date and other details, call Gene Salvay at (818) 788-3974 or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

Annual Flight Test Instrumentation Reunion - This group of retirees meets annually at the Fullerton Elks Club. For information, call Ed Mosbrook at (714) 531-8060 or Frank Vigil at (562) 691 -0236.

Tech Rep Association - A group of retired Field Service Technical Representatives has a yearly picnic in June at a park in Fallbrook. For more information, call TRA President Rafael Colunga at (760) 940-0525 or e-mail to rafael@nctimes.net.

The Annual M&P, P.D.L., "Friends Christmas Luncheon" - This group of retirees and employees have assembled in mid-December for a festive luncheon and gabfest for the past 19 years. Those wishing to participate and receive notice of the next December luncheon, call Fred Koellerat (310) 545-8854.

Saturn S-II Reunion - The 40th reunion luncheon will be held on May 18, 2002 from 11:00 AM to 3:00 PM at the Grand Hotel at 4101 E. Willow St. in Long Beach, CA. Tickets for the buffet luncheon, no host bar, are $20.00 per person. Those interested should contact Al Otto at (714) 775-4721 or send a $20.00 check made out to him at 11572 Candytuft Circle, Fountain Valley, CA 92708 or e-mail Gypsyma@aol.com.

Having The Best Jobs In The Company

by Albert (Al) Martin

Much has been written about the NAVAHO program with emphasis on the turbojet powered X-10 and rocket boosted ramjet G-26 vehicles. The ultimate goal was long range delivery of an atomic bomb. Some of the most interesting segments of the program involved a fleet of support airplanes and that's where some of the best jobs in the company were.

A unique aspect of the NAVAHO program was that North American Aviation developed all of the major vehicle subsystems in-house. There were no off-the-shelf systems available in the 1950's. This included the autopilot, flight control, radio command, telemetry, automatic approach and landing, autonavigator and radar tracking systems. An excellent development program was established for testing each system in an airplane prior to installation in the NAVAHO.

The airplanes involved were a YC-97, C-47, F-86, QF-80, T-33, T-28 and an F-100. All but the YC-97 were flown by a highly skilled group of NAA pilots including Eustis Hetzel, Bert Bantle, Jay Deming, Wendell Garton, Jack Waddell, Joe Murphy and Jack Nunnally.

The X-10 was designed to be flown by remote control from a ground station or from an airplane. It also flew automatically with an autopilot, autonavigator and the approach and landing system. The airplanes were equipped to test the NAVAHO systems and to simulate the X-10 and, to some extent, the G-26 operations. The QF-80 was equipped with a radio command receiver, the T-33 with a radio command transmitter, the F-86 with an autopilot and automatic approach and landing system, the C-47 with an automatic landing system and the YC-97 an autonavigator. The T-28 was used as a target for the radar tracking system and the F-100 was a chase plane.

The T-33 is a two seated jet and for our tests, the pilot flew it from the rear seat while the pilot in the front seat flew the QF-80 or the X-10 by remote control. As a precaution, a safety pilot sat in the single seat QF-80. This operation required a lot of skill and was successfully executed numerous times.

My own career evolved around these exciting operations. I reported to work in the Flight Test Group of the fledgling Aerophysics Laboratories, later named the Missile Division, in Downey, California in September 1951. I was hired because I was an ex-Air Force pilot with an aeronautical engineering degree. This combination led to some of the best jobs in the company as a flight test engineer and part-time pilot.

My first assignment was as a flight test engineer and co-pilot on the C-47 to test the automatic landing system at Edwards Air Force Base. The system included a radar altimeter, a sensitive barometric pressure unit and a flare computer. Jay Deming was the pilot and we placed a hood over his side of the cockpit and he made landings on the lake bed by "following the needles". My job as co-pilot was to keep us from crashing.

We eventually "closed the loop" and made completely automatic landings. We then flew the airplane to Florida and made landings on the runway at Cape Canaveral where the NAVAHO would be landing. The tests were very successful and the system was installed in the F-86 and, later, in the X-10 and the G-26. Several X-10 landings were made automatically. Lowell Wiley, an ex-Navy pilot and aeronautical engineer also flew with Jay on some of the C-47 tests. Not only was this phase of the program a lot of fun, but it was exciting to be at Edwards and the Cape Canaveral Air Force Station where aviation history was being made almost daily.

Another good assignment was as the flight test engineer on the YC-97 testing the stellar supervised inertial autonavigator. A typical flight was at night from Los Angeles International to Amarillo, Texas at 40,000 feet. We flew high and at night to enhance star tracking. The pilots were Air Force test pilots from Edwards Air Force Base. They liked to take naps, so I got a lot of "stick" time even though I was not authorized to fly the YC-97. One night, we were enroute to Amarillo when both, the Air Force pilot and co pilot, went aft to take a nap. I took over as pilot and Chet Moore, my flight engineer, took over as co-pilot. Harley Manning, our onboard inspector, reported flames coming from the No. 3 engine. Chet and I shut down the engine, feathered the propeller and headed the plane back to Los Angeles. We then woke up the pilots and, needless to say, they were a bit surprised. We didn't talk much about the incident and neither did they.

The autonavigator system was highly classified, so whenever we landed at Amarillo, our armed guards got off the plane and guarded it around the clock. It bugged the tower operators that we wouldn't tell them what we were doing. On occasion when we landed, the tower would direct us to make a 90 degree turn to the right or left and we would respond that we could not comply and request a 270 degree turn in the opposite direction. This bugged them even more. The reason we couldn't comply was because the stabilized autonavigator platform always pointed to the North Star, and the electrical cables sometimes got wrapped up when we made turns because we didn't have slip rings. Obviously we couldn't explain this to the tower.

LAX was frequently closed due to fog, and on one occasion we diverted to Edwards for landing. The plan was to spend the night and takeoff early the next morning for a daylight test of the autonavigator. That evening I decided to visit Pancho's Happy Bottom Riding Club that Yeager, Crossfield and other hot test pilots made famous! I guess I got a shot of bad whiskey, because I was too sick the next morning to get aboard the airplane. I asked the crew chief to find something wrong with the airplane to delay the flight. By noon, after a few glasses of Alka-Seltzer, I was ready to go and so was the airplane. Fortunately, there was a legitimate delay in the autonavigator checkout and the crew chief did not have to fake it. We didn't talk much about this incident either.

We had one other problem when we performed a night takeoff from LAX in an easterly direction. The C-97 which was the cargo version of the B-29 was very heavy and had a slow rate of climb. We managed to wake up the mayor and break several dishes. From then on, we couldn't fly unless the wind was from the west and we could fly out over the ocean. The NAVAHO autonavigator proved to be very successful and was the forerunner of systems used in missiles, airplanes, ships and space vehicles. The gyros were so accurate that the stellar supervised feature was not required.

Another interesting assignment was flying the T-28 to test the ground radar tracking system. A radar antenna was mounted on the northwest corner of Building One in Downey. Jay and I would dive toward the building and then make an abrupt pull-up at very low altitude. If we were going to make another pass, we would do an Immelmann, which was a fun upside down maneuver to get back into position. This caused some concern among the local residents, but as usual, we couldn't discuss what we were doing. The ground radar tracking system tests were also very successful, and the system was used in conjunction with the radio command system to control the X-10 and G-26.

I was not involved with them but the F-86, T-33 and QF-80 were proceeding in parallel with our tests. By late 1954, all the

The Best Job In The Company *(continued on page 11)*

A New Species of Warbird

by Dr. Raymond L. Puffer, AFFTC Historian

All through the long hours of 9 October 1953, North American Aviation technicians stationed at Edwards Air Force Base worked urgently on the control system of a very singular aircraft. Their all-white bird perched on tricycle landing gear and featured a pair of twin vertical stabilizers, canted outward — a configuration that is common enough today, but unknown in the early 1950s. A pair of canard wings emerged from either side of the long nose and its overall sleek lines, unbroken by any indication of a cockpit, suggested unusually high speeds. Far aft, a burly engine section with dual air intakes hinted at high levels of power.

On that October day, however, a team of engineers was concerned with the unmanned craft's control system. The X-10's first flight, planned for a week earlier, had been canceled when it's radio control system failed. Now they worked to replace and test a voltage inverter unit and replace a burned out alternator. At length, as the day came to an end, they completed their work and the X-10 was once more ready for flight. Five days later with all systems operating and the weather conditions perfect, the X-10 roared down its lakebed runway and lifted into the air. Under the guidance of a human controller in a T-33 chase plane, it flew for 31 minutes, reaching 20,900 ft and Mach 0.75 before returning to a stable controlled landing.

Strictly as an airframe, the X-10 was unusual enough. What lifted it into the futuristic realm, however, was its ultimate mission. The X-10 was neither an airplane nor merely a remotely piloted vehicle (RPV), but the flight test version of a ramjet-powered intercontinental cruise missile, dubbed the NAVAHO.

Even while the XB-52 was being built and tested, the Air Force was looking to the future, when unmanned high-speed missiles could attack a hostile force without risk of interception by enemy fighters. The term "cruise missile" had not been coined, but the Air Force was already developing two such systems in 1953. One of these, the Northrop SM-62 *SNARK*, was fairly conventional: a pilotless jet bomber with an internal guidance system. The *SNARK* system was eventually developed and briefly deployed, but it was slow and vulnerable to enemy attack.

The other approach was more radical, promising far higher performance. The North American Aviation XSM-64 *NAVAHO* was to be a supersonic ramjet vehicle with a range of 1,500 miles, to be launched vertically by means of a large, liquid-fuel rocket booster. The concept was highly advanced for the time, and the technological risks were formidable. Accordingly, the Air Force specified a supersonic turbojet test vehicle for the first step; it was to develop aerodynamic design data for the ramjet to follow. This vehicle, designated the X-10, was fitted with two Westinghouse XJ40 WE-1 turbojets with afterburners, that developed 10,000 lbs of thrust each.

The Flight Test Center marked off a 21,000 ft runway (07/25) at the extreme south end of Rogers Dry Lake, and during a two-year period several X-10s completed fifteen successful flights there. On 28 September 1954, X-10 Number Four reached Mach 1.84, becoming the world's fastest turbojet vehicle.

Events, however, were rapidly overtaking the *NAVAHO* program. The following month, on 18 October 1954, the Rocket Engine Test Station on Leuhman Ridge began preparing a test stand for a rocket motor to be used on the *ATLAS* intercontinental ballistic missile program. Ironically, the motor was a development of the *NAVAHO's* rocket booster. A pure ICBM would be simpler, cheaper, and have more range. The NAVAHO program was canceled in 1957.

Before that happened, though, the X-10 proved its worth. Its telemetry, autopilot, and auto approach and landing systems were validated and the airframe proved stable for its intended purpose. The X-10's twin vertical stabilizers proved optimum for sustained high speed flight, and the concept has been used extensively ever since.

About the author: After earning a BA in Political Science at Michigan State U., Dr. Puffer went on to obtain his MA and Ph.D. in History from the University of New Mexico. A lieutenant in the U.S. Navy Reserve, he served as Nuclear Weapons Officer aboard the USS Saratoga and with the Atomic Weapons Training Group of the Defense Atomic Support Agency. He has been assigned to the U.S.A.F. History Program at Kirtland AFB and Norton AFB and is currently stationed at AFFTC at Edwards AFB. Awards and recognition include Mensa, Air Force Heritage Project Award, Air Force Association Citation and the Air Force Association Medal of Merit. Most important, he is deeply committed to North American Aviation aircraft, especially the P-51 Mustang.



Photo courtesy of the AFFTC History Office

The Navaho X-10 No. 1 and ET-33 control aircraft roaring down the lake bed at Edwards Air Force Base during the first taxi test

The Legacies Left By North American Aviation (Part 1)

by John R. Moore

One of the great tragedies of the current high technology era is that the name of what was arguably the greatest high technology enterprise progenitor of this era is no longer known to most of its present beneficiaries. That name is North American Aviation, Inc. (NAA). Even most of us who have been privileged to work together at NAA seldom recognize the importance of the legacies that we have left to the technology, economy and standard of living that exists today.

Indeed, a strong case can be made that without the requirements, priorities and government risk capital, plus the enterprises that they spawned, the world's standard of living could have taken more than a century longer to reach its present level; the world would have been denied hundreds of millions of important jobs and career opportunities; and world civilizations could have been denied the capabilities to survive the current and projected battles against world population growth, affordable resource depletion and man's ravaging of the earth's ecosystems.

Furthermore, NAA should not only receive accolade for its many technological firsts and advances in systems engineering; it also made substantial contributions to the management of large, multi-faceted programs and the evaluation of high technology-based business opportunities. How do I know all of this? I was there during those heady days of the 1950s and 1960s when risks were taken and leverage technology was fashioning a new technology-based era.

In the summer of 1947, Dr. Simon Ramo who was a colleague of mine at GE invited me to come to California to see about taking a position under him at Hughes. While in Los Angeles, I ran into Lynn Gore for whom I had worked in turbine testing when I first joined GE and who was employed at NAA's newly formed Aerophysics Laboratory. There I met Dr. Bill Bollay, who headed the Aerophysics Laboratory. He told me that he had just hired Dr. N. E. Edlefsen as Director of Guidance and Control and that he would talk to Dr. Edlefsen about me.

When Dr. Edlefsen made me an offer to become the head of his Electromechanical Group of about 40 engineers, I decided to go to NAA rather than "getting involved with Howard Hughes" who had a reputation for substantial instability.

Accordingly, I joined NAA on February 2, 1948. At that time the guidance and control activity was concentrated on developing an inertial guidance system for the Navaho intercontinental cruise missile. To my delight, NAA had already hired some excellent engineers for me to work with, including Fred Eyestone, Bob Osborne and John Slater, whom I always thought intuitively knew more about inertial sensors than anyone else whom I ever met. During the same period, Dr. Edlefsen hired Dr. John Barnes as his assistant and Dr. Robert Ashby to head up the Electronics Group of the Guidance and Control Section.

Shortly after I joined NAA, the Aerophysics Lab was moved from LAD to the former Vultee plant in Downey, CA. The plant had a short runway which could handle general aviation and short field transport aircraft and was located next to the Red Star fertilizer plant on Imperial Highway. Consequently, when other parts of the area had smog, we claimed that we had "shog".

In addition to our work on the Navaho guidance and control systems, we set about building an organization which was to become unique among the electronics and control organizations of the defense industry. This was because we concentrated to the maximum extent on hiring generalists, extroverts and entrepreneurial types. The reason for this was that we were seeking leaders with drive and personal stamina, who could identify the important issues and recognize points of diminishing returns rather than solving the wrong problems very accurately. Much of this early hiring was done out of universities, where many of the grads were World War II veterans, attending on the GI Bill.

We ultimately ended up with so many outstanding professionals that suffice it to say we, we had top stars among our industry in all aspects of our work. Among all of these, I considered Dr. Norman Parker as the all-around best, with Fred Eyestone, Donn Williams, George Leisz, Al Grant, Leo Killen and Tom Schuler also super exceptional.

As our organization grew, we sought to stay on the leading edge of the technology which would let us compete successfully for the defense programs of that period. Thus, in 1949 when Bell Labs announced the first "cats whisker" germanium transistor, our electronics engineers duplicated it and followed very shortly with a duplication of the Bell Labs junction transistor concept. We immediately began designing circuits using junction transistors as soon as they became available. From that time on, NAA led defense contractors in the use of semiconductor circuits. In fact, we were the first organization to base operational system designs on integrated circuits.

Concurrently with the buildup of the Guidance and Control organization, Dutch Kindelberger and Lee Atwood were building up the other segments of the Aerophysics Lab. This included advanced pioneering work on rocket engines at the Santa Susanna field laboratory under the inspiring leadership of Sam Hoffman and on nuclear reactor engineering under the equally inspiring genius of Chauncey Starr. Of course, the work on aerodynamics, jet propulsion and aerostructures was well taken care of by the leaders who made NAA core competencies rated the best aircraft builder in WW II and the Korean War.

In the meantime, work on the Navaho missile was proceeding toward what would become an impressive series of "firsts". Our first guidance system, designated the XN-I, involved pressurized gas bearing gyros and double integrating accelerometers, plus an analogue computer. Its first flight was in a C-47 (DC-3) in 1950. This was the first aircraft flight of an inertial navigator and was successful until one of our engineers backed into a power panel and shut off the power.

In those days prior to the Korean War, we were in a strong competition for inertial navigation with Dr. Stark Draper's M.I.T. Instrumentation Laboratory. Dr. Draper's stable platform designs were all at least five axis systems, whereas ours had only three axes, used more computing and were much smaller than the M.I.T. designs. Dr. Draper vehemently maintained that the 3 axis systems were unstable and was reported to have awarded three Masters degrees on a joint thesis that purported to prove that five axes were the minimum number that were stable. We got a copy of the thesis and it took our Dr. Don Duncan just about two hours to find a sign error in the thesis and prove mathematically that a three non-coplanar axis system could always be made stable.

It was cause for celebration that we had beaten Dr. Draper to the first inertial navigation system aircraft flight. However, it was obvious that the XN-I design would not come close to meeting the Navaho's intercontinental requirements. This caused us to start a new design using a daylight star tracker, which if it could "see" through the Navaho's Mach 3 boundary layer, would give us a good chance of achieving the desired accuracy.

We also abandoned the pressurized gas supported gyro design, switching to our own version of a more conventional floated gyro. We also decided to use a digital computer design, based on

a rotating disc memory which we were developing at a time when other digital computer non volatile memories were rotating drums.

In the early 1950s, Bill Bollay left to join Studebaker in Santa Barbara and the Aerophysics Laboratory was reconstituted as the Missile and Control Equipment Operation (MACE) under Larry Waite. At about the same time, NAA was developing the F-86D interceptor version of the F-86 with the Hughes radar and radome. When Hughes briefed Dutch Kindelberger on the radar, what caught his attention was that the radar range was nominally proportional to the antenna diameter which, in the Hughes design, used only 70% of the radome dimension of the aircraft.

Having become impressed with the mechanical design capabilities of Dr. Edlefsen's guidance engineers, Dutch asked us to try to improve on the Hughes mechanical design, to allow for a longer range radar. I jumped at this opportunity, since I saw it as a chance to get into the airborne fire control business similar to what I was doing at GE. We managed to come up with a clever design which used about 90% of the radome dimension for the antenna diameter without impairing the resultant radar field.

We were also well aware of the potential problems and electronic countermeasures (ECM) vulnerability of the conical scan radar design which was all that was available for airborne radars at the time. Accordingly, Dr. Ashby, Gene Shelley, Bill West and Bert Holmes came up with a complete monopulse radar design by which weaknesses of the conical scan concept were eliminated. There was no complete airborne monopulse radar at the time; the closest being a GE design which was monopulse in traverse and lobe switching in elevation.

The NAA monopulse radar concept was something which we could sell thereby expanding our product line into the airborne fire control business. It ended up on the Lockheed F-104, the Republic F-105 and the NAA RA-5C. Our engineering model was the first completely monopulse radar that ever flew.

In the early 1950s, our gyro engineers came up with a paired, reversing gyro design which automatically canceled almost all of the error torques dependent upon the gyro angular momentum vector. This six gyro stable platform, in which three gyros performed the stabilizing function while the other three were reversing their angular momentum vectors, provided a concept which seemed to meet the Navaho accuracy requirements without depending upon a startracker. It was called "NAVAN" (North American Vehicle Auto Navigator).

Tom Curtis was the project engineer on the NAVAN, which was selected as the guidance system for the Navaho ram jet missile. This concept had so much promise that we recognized its potential application as an inertial navigator for submarines. Accordingly, we established as one design criterion that the stabilized platform and associated guidance electronics had to be small enough to pass through a submarine hatch.

By this time, the guidance and control computer for the Navaho was completely digital, with a rotating disc, non-volatile memory. It made its first flight in 1955 and was the first transistorized digital computer with a rotating disc memory ever to be flown.

All this while, excellent work was being performed on the development and design of the flight control system for the X-10 turbojet which had to be able to be recovered via an automatic landing. This work was also unique, not only in its dynamics and hydraulic redundancy concepts, but also in its use of completely solid state electronics moving toward completely digital architecture. Tom Schuler became the spearhead for this flight control work and effectively put us in the flight control business, leading to designs for the F-100 yaw and pitch dampers and flight controls for the Hound Dog and Minuteman missiles.

In 1955, Dutch and Lee decided to break up MACE into four product line divisions, each with all of the functions needed by a complete profit and loss (P&L) operation. Taking effect in November 1955, these were the Missile and Information Systems Division under Joe Beerer, the Rocketdyne Division under Sam Hoffman, Atomics International under Chauncey Starr and Autonetics under me. As general manager of Autonetics, I headed a division of more than 7,000 people.

In July 1957, Dutch Kindelberger called me into his office and informed me that the Navaho program was being canceled because the Air Force was going to rely on intercontinental ballistic missiles (ICBMs) Atlas and Titan. I got my first taste of a general manager's most unpleasant duty, laying off people and moving in all other viable ways with very little planning time to cut costs. At the time, Autonetics dropped from 7,800 to about 5,400 people by the beginning of 1958.

Fortunately, LAD had won the B-70 and F-108 programs so that some of my people could transfer to that division. Also fortunately, in the fall of 1957, the Missile Division had bid on the Hound Dog for which Autonetics had the guidance and control. When NAA won the Hound Dog program, it stopped our immediate need for further layoffs. In 1958 in quick succession, we won the radar for the Lockheed F-104 (used in Japan, Canada, Holland, Belgium, West Germany and Italy), the radar for the Republic F-105, and the Radar Equipped Inertial Navigation System (REINs) for the NAA Columbus A3-J/RA-5C.

However, the big prizes were the Polaris Fleet Ballistic Missile program and, for us especially, the USAF Minuteman solid propellant ICBM guidance and control program. Minuteman was unique, in that it had to sit for long times in silos, yet be ready for launch in less than a minute. This meant that very stringent reliability requirements had to be met. We put an all-out effort into the proposal for the Minuteman guidance and control system, based on our unique auto lubricated gas bearing gyros and M.I.T. Instrumentation Lab designed pendulous integrating accelerometers (PIGAs). We also had unique all digital guidance electronics and the first digital flight controls ever designed into a missile.

Our principal competitor was the General Motors AC Spark Plug Division, whom most people thought had a lock on winning the program. Being well aware of this, Dutch Kindelberger took steps to try to nullify GMs suspected political influence with the Congress and the USAF. On July 20, 1958, we were notified that we had won the Minuteman guidance and control program. That was the making of Autonetics.

Early in 1958 we had, with USAF approval, offered one of our NAVAN Navaho inertial navigators to the Navy for use on their nuclear powered submarine, the Nautilus which was preparing to try to navigate through the Bering Strait, under the ice to the North Pole. Here, our competition was Sperry, with an M.I.T. 5 axis designed inertial navigator. At this point, our decision to make our Navaho guidance system capable of being lowered down a submarine hatch paid off, because to get the Sperry unit aboard would require removing a side panel of the submarine. At the Navy's request, we sent Tom Curtis, the NAVAN project engineer, along to perform any service that might be necessary.

We heard nothing until August 3, 1958 when on a trip to Boeing in Seattle, I got a call from President Eisenhower saying that he had just been told the Nautilus had traversed the North Pole under the ice and the country thanked North American for supplying "the guidance system and the engineer" which made it possible. This was the first time that such a feat had been accomplished.

A follow-up to the Nautilus adventure was a similar mission with our NAVAN Navaho inertial navigator aboard the nation's

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second nuclear powered submarine, the Skate. This mission was also a complete success.

We now came up with an optimized submarine inertial navigator design under the leadership of Dr. Don Pickerel. Don went to the Polaris Program Office people in Washington, trying to exploit our Nautilus and Skate successes as proof of our competence for supplying the Fleet Ballistic Missile Program's submarine inertial navigation system. The R&D contract had been given to Sperry for an M.I.T. Instrumentation Lab 5 Axis system design. But, Sperry was having continued trouble meeting all of its program objectives and, fortunately for NAA and the Fleet Ballistic Missile (FBM) Program, the submarine navigation system was the responsibility of a Navy captain who wasn't afraid to put contract performance ahead of politics.

With Sperry eighteen months late and still not meeting contract commitments, he convinced the FBM Program Director, Admiral "Red" Raborn, to cancel the Sperry contract and give the FBM submarine inertial navigation program to Autonetics.

Of all the programs, Minuteman had the highest priority and the most challenging schedule. Seven defense contractors — TRW as program technical director, Boeing as missile designer-integrator, Aerojet, Hercules and Thiokol each responsible for a stage solid rocket, GE as silo and missile security contractor and NAA as supplier of G&C — were working with the Air Force to have the first flight of Minuteman by the end of December 1960 and an IOC four years from Boeing's contract award date, October 29, 1958.

It soon became evident that for such a buildup as all of the new programs required, the original Autonetics organization structure was totally inadequate. Much more decentralization of responsibility and authority was required. Accordingly, Autonetics was reorganized in 1959 along product lines into Navigation, Sensor Systems and Information Processing sub-divisions: and a functional division staff which provided centralized services to the sub-divisions where duplication of services was impractical.

The inevitable organization, management, management systems, software, facilities and equipment problems of rapid expansion produced so much chaos that the division escaped meltdown only because of the dedication, skills and stamina of its key people, many of whom worked 80 hours per week for as much as six months to stabilize the organization and continue to attempt to meet our contract commitments.

Despite all of these setbacks at Autonetics and similar ones at the other Minuteman contractors, plus the fact that the program involved substantial amounts of engineering development and proof of concept, the first successful flight scheduled for the end of December 1960 was actually made on the "63rd of December" 1960 (February 1, 1961). Also, ten Minuteman missiles were in their silos at Malmstrom Air Force Base in Montana on October 29, 1962, thereby, meeting the program's scheduled IOC.

In 1962, the Autonetics Division moved from Downey to a 125 acre orange grove site in northeast Anaheim; where NAA began constructing a number of buildings while facility entrepreneurs erected additional buildings for lease. The total facility reached 3 million square feet and could house comfortably about 20,000 people with two shifts on production. However, by 1964 we squeezed about 34,000 employees into the site by running three shifts in our factories and two shifts in engineering and support functions. Some engineers had to share the same desks between the day shift and the swing shift.

In addition to the early problems on the Minutemen, we were having alleged problems with our radar on the Lockheed European F-104 program. The original specifications called for a 50-hour Mean Time Between Failure (MTBF), but units being tested at the Lockheed facility on the F-104s were initially indicating an MTBF of 17 hours which, with time, dropped to 11 hours.

All of this had international repercussions, since the F-104s were being sold to the four-nation consortium of The Netherlands, Belgium, West Germany and Italy. The alleged reliability problems with our radar reached a point were the European government and industry representatives castigated me embarrassingly in a big meeting in Munich. I was then called before the USAF Secretary and told that I better get that radar reliability improved or it would be an international incident between governments.

Working round the clock between Autonetics Headquarters in Anaheim and Palmdale for about a week, I was able to determine two important things. The first was that the drop from 17 hours to 11 hours MTBF was the result of some improved test equipment which was catching more hardware problems than the old test equipment. The second was that, as soon as the problems in the radar of any F-104 were fixed, the radar was sold off with aircraft to the European customers.

Obviously what was happening was that we were discovering "infant mortality" problems in the radars. As soon as these were fixed, the radars were sold off without further testing to see how reliable the fixed units sans infant mortality actually were.

Fortunately, there were ten fully equipped F-104s that were continually being used to train European pilots in the operation of the aircraft and its systems. Flights in these aircraft with our radars totaled about 3000 hours so I got the failure records of those units and found that our radar MTBFs sans infant mortality was about 49.2 hours. When we presented this information to Lockheed, the Europeans and the USAF Secretary, the whole problem evaporated. However, to preclude any further episodes of this nature, we opened a radar overhaul and repair facility in Italy in a building provided by Fiat at the Torino airport and manned by our people. First, with Leo Killen and then Charlie Heim in charge.

Back at Autonetics, in keeping with our policy of making maximum use of state of-the-art technical advances, we embraced the concept of integrated circuits (ICs) which had been invented by Bob Noyce and Jack Kilby. We could see the potentially tremendous impact which these circuits could have on any type of electronics and immediately began building them in the Autonetics Research Laboratory. This gave us a leg up in the design and application of systems involving these circuits to our existing and contemplated programs. We began discussing them with our Minuteman USAF customer and TRW. In the early 1960s, we proposed using them in a new version of the Minuteman called "Minuteman II". Here, great improvements could potentially be made in performance, reliability, cost, size and weight.

In 1962 we received a contract to design a Minuteman II guidance and control system using the new — small and medium scale — bipolar ICs. This was the first use of ICs in a major operating system. Unfortunately, a new problem developed when too many of our ICs began to fail, most on the ground and a few in flight test. Our suppliers were unable to solve this problem as required to meet our schedule commitments, so we turned to our Autonetics Materials Lab under Dr. Arnold Miller to solve the problem. It wasn't long before Arnold and his scientists found the answer. The ground failures, caused by a phenomenon dubbed "the purple plague" were the result of an electromechanical problem caused by a mismatch of materials in contact with each other, whereas the few problems found in flight were caused by little solder balls that broke loose under the higher accelerations of rocket boost and caused electrical shorts.

Once these problems were diagnosed and corrected, the Minuteman II program progressed very efficiently and made the sched-

uled IOC in 1966 with a full wing of 150 missiles in silos.

Concurrently, our engineers and scientists were seeking the next Minuteman derivative that could extend the capabilities and cost effectiveness of the program. Led by Minuteman chief scientist Bob Knox, these people embraced the Multiple Independent Reentry Vehicle (MIRV) concept and started working with Rocketdyne to see how many multiple reentry vehicles could be separated to hit different designated target coordinates. This led to the Minuteman III missile, making the Minuteman program by far the largest revenue producer and profit generator in the history of Autonetics.



About the author: John R. Moore has been in the high technology industry since 1937, in management since 1941 and a general manager or higher most of the time since 1955. He has successfully run "bottom line" business operations varying in head count from 100 to 94,000. A graduate of the GE Advanced Course in Engineering (equivalent to D.Sc.) he was head of airborne flight control sight and computer development during WWII and led the Theoretical Section of GE's first missile program. In 1946, he became Associate Professor of Mechanics at Washington U. (St. Louis) and Director of its Research Foundation's Dynamical Control Lab. He left in 1948 to join NAA, where, after three engineering management assignments, John became the first general manager of the newly formed Autonetics Division in 1955 and a corporate officer with the title of President, Autonetics Division in 1960.

In 1966, John was elected Executive Vice President of NAA and a member of the Board of Directors and its Executive Committee. A prime mover in the North American-Rockwell Standard merger in 1967, he became head of the NAA segment; made up of Los Angeles Aircraft, Columbus, Tulsa, Atomics International, Rocketdyne, Space and Information Systems, and Autonetics Divisions with the title President, Aerospace and Systems Group. He was also elected to be a member of the North American Rockwell Board of Directors and a member of the Board's Executive Committee.

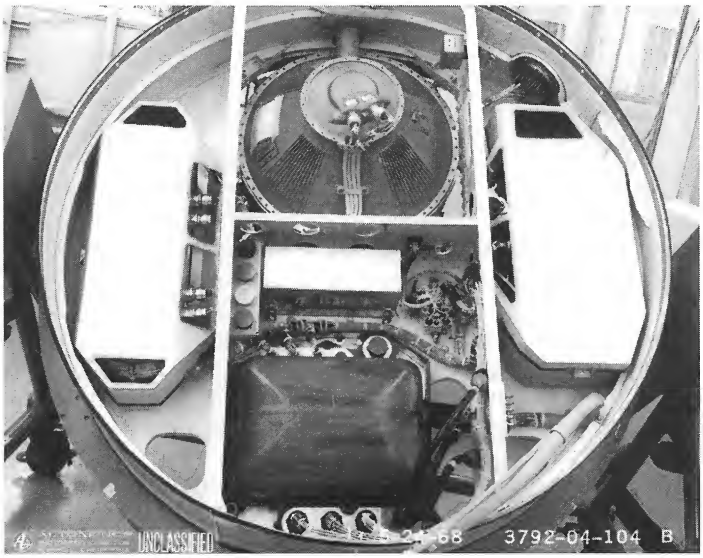


Photo from the Bob Nease Collection

The Minuteman III Missile Guidance Set Configuration with the Gyro Stabilized Platform in the upper quadrant, the Platform Electronics in the right quadrant, the P92 Flight Control and Ordnance Electronics in the lower quadrant and the D37D Computer in the left quadrant.

John Moore restructured the North American Aviation Corporate Office, reducing its size from 800 to 331 personnel by 1970. The Venture Analysis System which he installed resulted in three highly successful equity acquisitions and the avoidance of thirteen other business opportunities which cost their ultimate acquirers more than eight billion dollars.

He was elected to the National Academy of Engineering in 1978. He is a Fellow of the Institute of Electrical and Electronic Engineers, the American Institute of Aeronautics and Astronautics and The Institute of Navigation. He holds 25 patents, served on seven DoD Committees and has received nine major achievement awards from various technical organizations.

After the Rockwell takeover of North American Rockwell in 1970, John joined McDonnell Douglas as Vice President, Subsidiaries and in 1971 was appointed President of the Actron Division which he helped form. He retired in 1978 for a brief stint as a consultant. He joined Northrop in 1979 and retired from Northrop in 1989.

Sam Iacobellis Receives the 2002 Memorial Award From the Aero Club of Southern California

The significant achievements of Sam Iacobellis to aerospace advancement were recognized January 24, 2002 when he was awarded the Howard Hughes Memorial Award at the Aero Club of Southern California annual dinner held at the Jonathan Club in Santa Monica. The award was presented to Sam by Willis Hawkins, former senior executive of the Lockheed Corporation and last year's honoree. Sam joins 22 prior honorees of this prestigious award including Lee Atwood in 1993.



North American Aviation in Europe – The Cold War Years

by Robert J. Clark, Director - European Operations

Late in 1956, "Dutch" Kindelberger and Lee Atwood reviewed with NAA Management the growing Soviet military menace in Europe and the degree to which NAA could bolster the defenses of our NATO allies. A number of F-86 Sabres had already been transferred and were operational on the continent. NAA Tech Support for these aircraft were headed by Cliff Stevenson, based in Wiesbaden, Germany. Separately, at the CASA company outside of Madrid, Spain, an NAA team under contract to the USAF was supporting the overhaul and modification of F-86's and F-100's destined for NATO use.

Aware of the potential business in the growing aerospace technical environment in Europe, a decision was made to post a general business representative in Europe. I had been a Washington based liaison to the Pentagon for three years when I received a call to report to "Dutch" Kindelberger. He offered me the job and when I accepted, "Dutch" rose from his seat, smiled at me and said, "Good. It's that way. Get going".

I was given no specific relocation advice. However, a number of the commercial aircraft sales personnel were operating out of Geneva, Switzerland. It was free of wartime damage and offered housing, schools, telephones and good airline connections. The threat of high business taxes in France, the U.K. and Germany made Geneva the logical choice for NAA. Swiss bureaucrats in Bern were not convinced that NAA was indeed a manufacturer and not a general American industry voice. It took the Chief of the Swiss Air Force to convince them who we were.

The next step came from NAA Counsel Gerry Brophy who recommended two ranking Geneva businessmen to join Senior V.P. Larry Waite in forming the new board of directors of North American Aviation S.A. (same as Inc.), an NAA subsidiary under Swiss law to act in the arena of finance and information. One of the Swiss was Henri Huguenin, a Swiss Bank Corporation V.P. who served in the U.S. Army during World War II as an artillery officer. The other, Robert Turrettini, was a local business attorney.

Starting in 1957, we grew in the following years to a staff of six in Geneva. When local representation became desirable, we opened NAA S.A. sub-offices in Paris, London and Bonn. U.S. personnel retained their security clearances but no classified material was kept on site. The secretaries represented six different nationalities. We served all divisions within the corporation.

Together with my talented English administrator, Tony Pepper, we had to deal with locating offices, local ordinances, hiring and firing of staff, payrolls and deductions, housing, schools, medical advice, marriages, divorce and, most regrettably, with suicide.

Early on, Atomics International engaged Dr. Henri Polak, a nuclear physicist located in Washington, D.C., and relocated him to NAA S.A. to assist in negotiations with a French government company to gather and transfer public nuclear research information. Dan Byrnes, from Corporate Legal, came over to assist in the very difficult two-language contracts.

In the end, the subject proved to be much too sensitive and the project was ended. It was an early example to us of the tight control maintained by our government of the transfer of high tech information needed in the rebuilding of the European Industrial Base. The initial fee, paid through NAA S.A., was refunded as a gesture of "good will" which kept doors open at French bureaucratic levels to the later benefit of other NAA divisions.



Photo from the Bob Clark Collection

During his four week tour of USAF installations in Europe in late 1957, Dutch and Helen Kindelberger posed in front of the "Mermaid" statue in Copenhagen with their hosts Bob and Joan Clark.

In March, 1958, I flew to Oslo, Norway to represent NAA in awarding a trophy to an outstanding RNoAF squadron flying F-86 Sabres. I was joined by Colonel Bill Banks and, together, we flew over the fjords to Boda, above the Arctic Circle, for an outdoor ceremony. The line of troops standing on parade exercised periodically to keep warm but we had to stand still on the reviewing platform. Fortunately, all other activities were conducted under an extensive area of solid granite!

Next to arrive at Geneva were LAD reps Dick Erb, Gage Mace and Dick Baldwin. They were contacting regional airlines to obtain reactions to an NAA study for a feederliner size twin-jet airplane. To add realism, Baldwin created flight schedules for an imaginary airline — years ahead of a computer generated program. Baldwin also went to Beirut, Lebanon, then an airline hub with Boeing and Douglas reps stationed there. However, the warring factions started shooting and to avoid getting hit by a stray bullet, "he stayed in the iron bathtub in his room until he could leave town". The airliner project was dropped soon afterwards. George Mace was also acting as a demonstration pilot with the only Sabreliner in Europe. It was owned by a Milanese publisher but was based in Switzerland. As these ventures ended, the pilots were reassigned to the startup of Autonetics operations — but that is another story.

In this same timeframe, the USAF began transferring F-100C aircraft, after modification at CASA in Madrid, to the Turkish and French air forces. Col. Art Debolt, USAF Ret., came to Europe as our corporate representative and I joined him in his rounds at delivery time.

Turkish base conditions in wintertime were an "eye opener". All comforts, if any existed, were minimal but the uniformed personnel were enthusiastic, demonstrated exceptional capabilities and had high morale. Debolt's comments were received in barnlike unheated halls. We were convinced that little English was understood but they were glad to see those airplanes. Unfortunately, they were used later in the assault on Cyprus.

In contrast, the French reception of the airplanes at an air force base in the Jura mountains, north of Geneva, was quietly polite and private. We assumed that their government did not want to publicize the need for foreign aircraft while Dassault was in the early stages of development of the "Mirage".

Some months later, two NAA Field Service representatives were posted to Europe to expedite support to NAA aircraft flying under other NATO flags and were assigned to NAA S.A. Bill Grover came from Korea and went directly to a home he rented in Paris for liaison with the U.S. European Command and NATO offices located there. Ray Goodwin weekended in Geneva and was, otherwise, housed in Chateauroux, France, home of a major USAF/NATO materiel depot. The town itself, however, was off-limits because of the very hostile French Communist population.

The German Air Force wanted a resident tech rep on a commercial contract (not via USAF channels) for a special F-86 job. Herr Schmidtgunst of the GAF legal office held up the job for over a year because he couldn't believe the costs of salaries, housing, travel etc. He was an older WW II retread non-Nazi that I was asked to deal with. His office in Koblenz overlooked the Moselle River joining the Rhine, making these visits somewhat more pleasant.

"Dutch" Kindelberger toured our facilities in those years, followed by the heads of Autonetics, Columbus and Rocketdyne: John Moore, Will Yahn and Sam Hoffman. NAA's business in Europe was about to take off! These actions will be reported in a subsequent report!



About the author: Born in Evanston, Illinois, Bob lived in over 30 homes in 20 cities and attended 12 schools as Montgomery Ward promoted his father to various posts across the nation. In 1934, the family finally settled in Southern California. Attending Caltech, Bob obtained an MS degree in Aero Engineering and in 1943 joined the NAA Preliminary Design Group. After serving in various design and project functions, he was assigned to Washington, D.C. where he coordinated activities with the Navy Bureau of Aeronautics. He was, subsequently, sent to Europe to establish NAA European operations and, finally, to oversee company offices worldwide. He later joined the Northrop Corporation where he served four years as a U.S. delegate to the NATO Industrial Advisory Group and, then, led a DoD sponsored international engineering group studying technical improvements to the European air defense system. Bob currently resides with his charming wife, Midge, in Channel Islands Harbor, CA. where he continues to expand his aircraft library.

Having The Best Jobs In The Company
(continued from page 4)

components were developed and it was time to fly the X-10 at Edwards. The first flight and several others were very successful. X-10 No. 1, Tail Number GM19307, flew ten times and is now at the Air Force Museum at Dayton, Ohio.

Something that is not very well known is that we almost made an X-10 night flight. Glenn Snyder was the test conductor and I was his assistant. We were on the lakebed conducting a simulated flight and were running the turbojets in afterburner. It was an awesome sight, particularly at night with the flames streaking out of the rear end. Glenn and I were in the test conductor shack and I was reading the countdown procedure over the intercom. When the engines were verified at full thrust, I said "Chock release". That was supposed to be a simulated step, but the console operator threw the switch and the wheels jumped out of the chocks! Fortunately, a safety chain was attached and held the missile, or it would have been a spectacular flight. Glenn became known as "Chock Release Snyder" which was unfair because it wasn't his fault.

The NAVAHO flight operations were moved to Florida in early 1955 and I moved there also. There was more excitement to come and more of the best jobs in the company. I was getting paid for all of this, but I would have paid just to get in the gate!

About the author: Al Martin started at NAA as a flight test engineer on the NAVAHO program at the Missile Division in 1951. He transferred to Florida in 1955 where he was a NAVAHO G-26 test conductor. He returned to Downey in 1960 as the Saturn S-II Director of Test Operations and, in 1965, went back to Florida as Director, S-II Launch Operations. At the conclusion of the Apollo program, he returned to Downey as Chief Engineer, Shuttle Systems Integration and, later, as Chief Engineer, Orbiter DDT&E. His final move to Florida came in 1982 where he retired in 1990 as Vice President, Florida Operations. Degrees and awards include an MS Aero Engineering from the University of Texas, three NASA Public Service awards, a NASA Distinguished Public Service medal, two Astronaut Snoopy awards and a National Space Club Lifetime Achievement Award. During World War II, he was a B-26 Marauder bomber pilot with the 9th Air Force in Europe. After the war, he flew the NAA F-82 in the Air Force Reserve. Al currently resides with his wife, Glennadora in Cocoa Beach, FL.

CONGRATULATIONS and HAPPINESS to

Bob and Joyce Crockett of Bishop, CA on their 50th Wedding Anniversary

Bill and Sandy Carter of Hesperia, CA on their 30th Wedding Anniversary

Donald and Helen Swenson of Villa Park, CA on their 50th Wedding Anniversary

Contrails From The Past

by Ed Rusinek

Dear Ed,

In the late 1950s I was in the Air Force stationed at George AFB in Victorville, CA. My specialty was the repair of radar and night controls for the F-86L and Convair's F-102. At the time, NAA was developing an automatic landing system and had been loaned an older F-102 to support the development testing. Because our Fighter Interceptor Squadron had the only F-102 flight control maintenance equipment in Southern California, an arrangement was made for engineers from Armament and Flight Controls to perform some of the checkout and testing at Victorville. I was assigned to support the effort. Though reluctant at first, I soon grew to be an enthusiastic member of the team. The test pilot for the project was Bob Gorham, who had flown many types of military airplanes. As the testing progressed, problems developed which indicated that more engineering work was required. After several months, the testing at Victorville was suspended.

In 1960, I was discharged from the Air Force and planned to get a job in aerospace while I continued my studies in engineering school. The job I found was at the NAA facility in Downey, CA. At that time, NAA had just won a contract to build navigation systems for Polaris submarines and they needed help. Although I preferred something related to airplanes, I took the job thinking that it would be a temporary measure. When I retired in 1997, I was still working in undersea navigation as the manager of Fleet Systems Engineering.

Along my career path, there were times when money became scarce and I went on loan to other projects. The most exciting one occurred in 1968 and involved the testing of an airborne laser range finder and tracker. The system was mounted in a Sabreliner with an optical port faired into the underside of the fuselage. The first pilot to fly on the project was Bob Gorham whom I met some nine years earlier! Most of the test fights were conducted at night over a range at Edwards AFB. Looking through gimbaled optics was very disorienting and I needed a dozen flights to get a handle on airsickness. Still, it was a great time. Again, as in many projects, the funding dried up and the project was shelved.

I finally graduated from Cal State in 1970 and returned to the navigation business where work was just beginning on a marine version of the electrostatic gyroscope. In the 30 years since, this amazing device has set the world standard for navigation accuracy and continues to guide Trident submarines on their missions of deterrence.

— Ralph Guymon, Orange, CA

Dear Ed,

My husband, Charles Ken West, has been at the Willow Lake Nursing Care Center for the past seven years with a form of Parkinson's disease. Although he is confined to a wheelchair due to a broken hip, his mind is still very much alert and he would love to hear from his former co-workers and friends. Ken worked at LAD, Downey and Autonetics before he retired in 1984. The care center is just around the corner from the old Elks Club on Willow Avenue and his address is Ken West, Station C, Room 53A, c/o Willow Lake Nursing Care Center, 2615 Grand Ave., Long Beach, CA 90815.

— Martha West, Long Beach, CA

Ed's Resp.: This is a love story! Ken and Martha have been married 58 years and she is totally devoted to his care, spending every moment with him. Can we respond in kind?

Dear Ed,

I would like to add some interesting bits of information to the "Zero Launch" article in the Winter 2001 issue. We had an F-100 "Iron Bird" in the Flight Simulation Laboratory in Building #3. It was tied into the analog computers in the Laboratory. Al Blackburn spent many hours in the simulator, practicing "Zero Length" launches. Part of the program included various emergency conditions. I well remember him practicing a hung booster situation. In the safety of the simulator, he continued to "fly" after the booster hung up. He said it was a challenge at best! As I recall, at the time, the procedure in case of a booster hang up was to immediately bail out. That too was a challenge because of the relatively low altitude.

During the early flights, "Blackie" told us the simulation was quite representative. With that experience, he became confident in the ability of the simulator to reflect the F-100's behavior. He told us later that on that fateful day when the booster hung up, he decided to fly the plane and try to shake off the booster rather than immediately bail out. Unfortunately, he couldn't shake the booster off and, eventually, had to bail out at a safer altitude. He did complain about one thing, however. His parachute lower straps were not quite properly adjusted and he had a very painful and "private" jolt.

Thank you for all the work you folks put into the Retiree Bulletin. The symbol of excellence lives on.

— Kenneth J. Dyda, Rancho Palos Verdes, CA

Dear Ed,

Since my retirement eight years ago, I have been involved with the Future Scientists & Engineers of America organization as an after school mentor for children, grades four through twelve, enrolled in the FSEA. I find this to be a very rewarding time in my life, assisting our young people into careers in engineering, manufacturing and the sciences. There is a need for men and women to serve as volunteer assistant mentors to guide our children. If anyone is interested, please contact me at (714) 537-7149.

— Dick Hillman, Garden Grove, CA

Ed's Resp.: This is a wonderful program for retirees to take on. There are FSEA chapters in many parts of the country and the children could benefit richly from the extraordinary knowledge and experiences of our retirees. To find out if a chapter exists in your area you may contact FSEA at (714) 229-2223 or e-mail at fsea@fsea.org.

Dear Ed,

As I was preparing a check to extend my subscription for the bulletin, I found myself reminiscing. It came to me that events at NAA actually influenced the date of our 60th wedding anniversary, June 5, 2002.

I started my career at NAA at LAD in 1939 in fuel systems design under John Young. In early 1942, I was asked if I would accept a transfer to Dallas, Texas starting in June. I accepted, then realized I had been courting my future wife, Maxine, for over three years and was not about to be separated. We were married on June 5, 1942 and took a two-week honeymoon on our way to Dallas. After WWII, I returned to LAD, then moved to Downey where I retired in 1978.

When my wife catches me reminiscing about the tremendous technology advancements that occurred at NAA during this period, she suspects that I have fuel in my veins, not blood.

— Sincerely, Warren (Pat) Bratfisch, Mesa, AZ

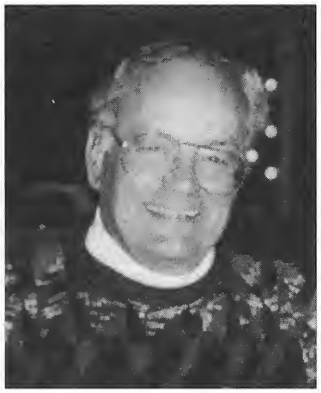
Ed's Resp.: So tell us, Pat. How long would you have waited to propose if NAA didn't ask you to go to Dallas? Only kidding! God Bless you both on your 60th anniversary.

The Silent Majority

by Stan Guzy



GABRESKI, COL. FRANCIS S. "GABBY", 83 - "America's Greatest Living Ace" died January 31, 2002 after suffering a heart attack at his home in Dix Hills, NY. Airborne at Pearl Harbor but too late to engage the Japanese attackers, he requested a transfer to England where he was assigned to the Polish RAF 315 Squadron flying Spitfires. Flying 20 missions with the Poles, he learned their superior tactics which he, subsequently, used as a member of the newly formed USAAF 56th Fighter Group flying P-47s. He went on to destroy 28 German aircraft in the air and 3 on the ground. On July 20, 1944, his propeller tip struck the ground during a low strafing pass over a German airfield. He spent nine months in Stalag Luft No. 1. After a stint of civilian life, Gabreski returned to the USAF as a test pilot. In 1951, he went to Korea where he assumed command of the 51st Fighter Interceptor Wing. Flying an NAA F-86, he shot down 6 1/2 MiG-15s in dogfights at the speed of sound. Completing 100 missions on Korea, he was assigned as chief of flight safety research at Norton AFB in San Bernardino, CA. During visits to NAA/LAD, he always praised the quality and superiority of NAA aircraft. Retiring from the Air Force as a double ace, Gabreski destroyed 37 1/2 enemy aircraft during 266 combat missions in two wars, flying propeller and jet aircraft.



THOMAS, RICHARD E. "DICK", 69 - died on January 18, 2002 in a plane crash while trying to land in Punta Pescadero, a fishing village near La Paz, Mexico. The airplane was a Rutan home-built *COZY,* owned and piloted by his friend, Andir Maroun. Dick hired in at NAA as a draftsman in Downey in 1952. In 1953, he joined the Army Signal Corp and returned two years later to NAA as a resident representative at the White Sands Missile Range. As an NAA engineer, Dick worked on the Hounddog, Apollo and Space Shuttle projects. He was the company point man for the Space Shuttle program. During the countdowns at KSC, it was Dick, surrounded by his staff of experts, who evaluated all of the data available and gave the final launch go-ahead. After 44 years of outstanding commitment to America's Space Program, Dick retired in 1996 as Vice President and Program Director of Space Shuttle Operations. He owned two planes — a Vari-Eze and a Bonanza — which he had hangared at the Chino Airport. He lived in Fullerton with his wife, Eva Beth.

ABELE, MARY L., 89 - died in Las Vegas, NV of congestive heart failure on December 27, 2001. Mary was a production control coordinator at NAA/LAD when she retired after 37 years. We were notified by her daughter, Christine Jackson.

ADLER, JOSEPH, 83 - died of lung cancer in Laguna Hills, CA on December 29, 2001. From the Orange County Register obituaries.

ANTUONO, PAT, 78 - passed away on November 6, 2001 in Las Vegas, NV of cancer. Pat retired after working 25 years in Production Control at NAA/LAD. We were notified by his stepdaughter, Christine Jackson.

BURDETT, CHARLES E., 91 - died on January 13, 2001 at Devonshire Care Center in Hemet, CA. Charles was an engineer at Rockwell for 15 years. We were notified by Gene Somers.

BUXTON, FREDERICK L., 85 - passed away from pneumonia on September 26, 2001 in Laguna Hills, CA. Fred was a senior buyer in LAD Purchasing when he retired.

CARTER, LEWIS E., 71 - died on January 28, 2002 at his home in Ohio. He was employed at Rockwell International and McDonnell Douglas for 42 years. Obit sent to us by Kenneth Braidic.

CLOVER, ROSE MARIE, 92 - died of heart disease on December 7, 2001 in Stanton, CA. She was an electronic operator at North American Rockwell for many years.

COCKBURN, ROBERT J., 71 - died on May 11, 2001 at Mt. Carmel Medical Center in Ohio. He retired from North American Rockwell after 10 years.

DEARMAN, PATRICIA A., 75 - passed away at Kaiser Permanente in Riverside, CA on December 26, 2001. She was a quality control inspector with Rockwell in Newport Beach, CA.

DIVVENS, DONALD A., 85 - of Yorba Linda, CA, passed away from congestive heart failure. He was an engineer at Rockwell.

DUNNING, WILL - passed away on July 25, 2001 from a stroke. We were notified by Sandy Carlson.

FARMER, EUGENE A., 81 - died at his home in Crescent, OR on November 23, 2001. He worked as a mechanical engineer at NAA until he retired in 1975.

FIORE, ALEXANDER T., 75 - died on January 3, 2002 at Los Robles Medical Center after a lengthy bout with cancer. He was very active in local, state and national politics. Alex was employed by Rocketdyne in Canoga Park where he retired as the Controller and Vice President of Finance.

FISHER, DOROTHY, 81 - died on December 10, 2001 at the Menifee Valley Medical Center in California. She was an executive secretary at NAA/El Segundo for 25 years.

FOX, DONALD "DON", 74 - passed away on January 26, 2002 due to complications from a stroke. Don retired to Cambria, CA after 30 years as a master scheduler at Rockwell. His loving wife, Shirley, notified us.

GERBER, ALBERT, 85 - passed away at his home in Walnut Creek CA after an 18 month battle with cancer. Al was a facilities engineer at LAD/El Segundo for 40 years. We were informed by his loving wife, Janyce.

The Silent Majority *(continued on page 14)*

The Silent Majority *(continued from page 13)*

GOW, KENNETH P., 84 - died on August 12, 2001. Ken started at Autonetics in the late 60's. Assigned to the Minuteman program, he invented what became known as the "Gow Flip". He retired after 36 years.

GREEN, MARION L., 82 - died on December 23, 2001 at Good Samaritan Hospital in Los Angeles, CA. She was a circuit board inspector at NAA/Rockwell for 22 years.

GRESSARD, JOHN P., 77 - died of complications from Parkinson's disease on January 21, 2002. John worked at Autonetics in the radar/antenna engineering groups from the late 50's until he retired in the early 80's.

HATFIELD, HAROLD, 77 - died of heart disease in Helendale, CA. Retired as a production engineer from NAA/Rockwell in 1983.

HADEN, GREGORY W., 54 - died of cancer on September 11, 2001 at his home in Palos Verdes Estates, CA. He was Vice President of the Rockwell Administrative Services Center. We were informed by a friend, Eva Beth Thomas.

HANSEN, CHET, 88 - died on January 13, 2002 at Fredericka Convalescent Hospital in Chula Vista, CA. Chet worked in Experimental Flight Test Engineering at LAX and retired in 1976. We were informed by his longtime friend, Norman Deitchman.

HENDRICK, PEGGY E., 92 - died on January 18, 2002 at a convalescent hospital in Fullerton, CA. Peggy was a secretary atNAA/Rockwell in Inglewood for 32 years before she retired in 1977.

HESSENFLOW, FRANCIS H. "SLIM", 85 - passed away peacefully on January 2, 2002 at his home in Artesia, CA. He devoted 38 years to NAA/Rockwell. Submitted by his granddaughter, Ursula.

JUNKER, MELVIN, 73 - died January 22, 2002 of a stroke. He was one of the original landscape employees located at the new Anaheim Employees Recreation Center in the 60's. As Park Maintenance Supervisor, he and his family resided at the center for more than 25 years until he retired in the 90's.

KAPPES, GEORGE L., 76 - died on January 2, 2002 of emphysema. He was an export manager for Rockwell International.

LANGLOIS, OMAR G. "CASEY", 83 - died from a brain tumor on October 12, 2001 in Easton, MD. He was an electrical engineer in the Off-Site Quality Assurance Department with 39 years of service at LAD, Downey and Autonetics. We were informed by Casper Simpson.

LISCANO, ISMAEL, 79 - died at his home in Sun City, CA on October 15, 2001. He was a Quality Assurance supervisor at Rockwell International for 30 years, working on the Apollo project.

LOUCKS, GERTRUDE F., 71 - died on October 27, 2001 at her sister's home in Lakewood, CA. She worked in Production Control at Rockwell International in Anaheim for 29 years.

McCAMBRIDGE, VIRGINIA M., 87 - passed away on October 9, 2001 in Sun City, CA from complications following a stroke and hip surgery. Virginia worked as a key punch operator in the Payroll Department in the late 40's and 50's. We were informed by her beloved husband of 61 years, Frank.

McCUSKER, DONALD F., 76 - died on June 23, 2000 at the Columbus Alzheimer Center in Ohio. He served as a test pilot for both North American Aviation and Martin Marietta for several years.

MESSINA, JOSEPH L., - passed away on September 30, 2001 at home in Magalia, CA after a long battle with emphysema. Joe worked for 20 years in Maintenance at Atomics International in Canoga Park. We were notified by his loving wife, Wilma.

MILLER, WILLIE, 90 - died on December 1, 2001 from respiratory failure and kidney disease. Willie was in Manufacturing management for many years. We were notified by his son-in-law, Leo Schorsch.

MOORE, CARLOS A., 81 - passed away in his sleep on January 22, 2002 at his home in Whittier, CA. Carlos worked in Engineering Mass Properties for 34 years and began his career at the NAA/LAD Division in 1950. He retired from the Shuttle Program Office in 1983.

MUNGARAY, MIKE, 82 - passed away on February 13, 2002 of pulmonary complications. Mike worked on the XB-70, Saturn and Shuttle.

NAGLE, PATRICK J., 82 - died on January 2, 2002 of heart disease at his home in Mission Viejo, CA. He was a buyer for Rockwell International.

POWELL, ALBERT V., 80 - passed away on December 2, 2001. Al worked in Structures Engineering at LAD, Palmdale and Edwards on the XB-70 and B-1 programs. After a twenty year career, he retired to Tehachapi CA.

QUICKSTAD, ARCHIE M., 87 - died on December 16, 2001 of pneumonia. Archie worked in Manufacturing and Planning from 1941 to 1974.

RABENBERG, BERLE E., 78 - died on September 16, 2001 at his home in Julian, CA. He studied aeronautical engineering and worked in Flight Control Analysis at NAA. He was also very active in his community.

RAGLAND, MARSMALL A., 88 - passed away at his home in Hawthorne, CA of heart failure on December 14, 2001. He worked in Engineering Documentation and Design Requirements Manuals at NAA/LAD in the 50's and 60's. He left NAA in 1969 and worked at Northrop for a few years before retiring. We were informed by Michel Juif.

RINALDI, FRANK SR., 81 - died on September 30, 2001 in Hesperia, CA from a cerebral hemorrhage. Frank retired from NAA after 35 years.

ROBINSON, LLOYD P., 78 - of Mission Viejo, CA died on January 23, 2002 of heart disease. He retired as an engineering planner from the Boeing Aircraft Company.

SANCHEZ, PETE, 76 - died of liver disease in Westminster, CA on December 29, 2001. He worked as a custodian for Boeing.

SCHIERBERT, JAMES H., 67 - died of undetermined causes. He worked as a painter for NAA/Rockwell and lived in Garden Grove, CA.

SIMPSON, RAY B., 72 - died on November 12, 2001 of cancer at his home in Lake Elsinore, CA. He was a senior buyer until he retired in 1990.

SMITH, WALTER J., 80 - Walt died on January 22, 2002 in Palm Springs, CA. He retired in 1982 after 31 years at NAA/Rockwell, working many years on the Minuteman Guidance and Control programs - in Engineering and Program Management. He was a VP of Quality Assurance at Autonetics at his retirement. From information provided by Lou Terry Purpura.

SPICER, DONALD E., 70 - died of cancer on January 11, 2002 at his home in Fullerton, CA. He was a retired general supervisor at Rockwell.

STEIN, PAUL - died in December 2001. Paul worked at Autonetics Financial until he retired in 1986. He also served on the board of the NAA Rockwell Credit Union from 1973

through 1995.

STORRER, JOSEPH, 93 - died on January 13, 2002 of natural causes. He was a maintenance mechanic at Rockwell.

STUBBLEFIELD, GEORGE P., 84 - died on November 26, 2001 at Hemet Valley Medical Center in Hemet, CA. He was a fireman at Rockwell in Canoga Park for 18 years.

SUMMERS, FRANK - passed away on December 1, 2001. Frank worked in Field Service Operations at LAD. We were notified by Mike McGinnis.

SWENSON, ROBERT A., 83 - died January 23, 2002 at his home in Fullerton, CA. Bob was a tool and die grinder at Rockwell in Downey.

THOMPSON, RUSSEL R., 83 - died of natural causes on December 22, 2001. He worked as a design engineer for Rockwell.

THOMPSON, FRED S., 79 - passed away on December 2, 2001 of a heart attack. He lived in San Juan Capistrano, CA after retiring from Boeing/NAA.

UNDERWOOD, NORMAN, 82 - died of complications on February 22, 2002 in Lancaster, CA. Norm was a maintenance mechanic at Edwards, Palmdale and LAD before retiring in 1986. We were notified by his daughter, Penny Ellis.

VAN SLYKE, C. M. "VAN", 86 - died after a long illness in December 2001. He worked at LAD and at Space Division in Downey and Seal Beach for over 40 years. Reported by his nephew, Dick Van Slyke, also a retiree.

VIETOR, MARY - passed away on December 29, 2001 after a long bout with cancer. She was employed at Autonetics in Anaheim.

WATSON, R. J. "DOC", 85 - died on December 24, 2001 of blood cancer at his home in Hilton Head, SC. "Doc" was a retired USAF Colonel and worked in the NAA/Rockwell Office in Washington, DC for many years.

WILSON, GEORGE L., 97 - died suddenly at his home in Yorba Linda, CA. He worked at LAD as a tech writer and was in Quality Assurance when he retired in 1981. Passing reported by a friend, Cordell Bussel.

WOODWARD, ROBERT "WOODY", - died on November 26, 2001 in Sun City, AZ of heart failure. He worked at the Columbus Division, designing landing gears for 35 years until he retired in 1984.

WRIGHT, ANNA E., 83 - died on December 10, 2001 at a health care center in Perris, CA. She was a clerical worker at NAA for over 11 years.

PAX DOMINI SIT SEMPER VOBISCUM

DEAR READERS!

In submitting a notification for the Silent Majority, we ask that, if possible, you furnish the following information: the full name of the deceased, the date of death, where death occurred, the year of retirement, the number of years of service, the division(s) where service performed. This is our final salute to a NAA/Rockwell/Boeing family member and we want his or her passing, regardless of rank or position in the company, to be more than a statistic. Thank you and God Bless!



Photo from the Bob Nease Collection

The NAVAH0 X-10 being prepared for flight at the Cape Canaveral Auxiliary Air Force Base (CCAAFB) in 1955. The Air Force Missile Test Center (AFMTC) was the only site available which permitted straight-line flights of over 1,500 miles without passing over populated areas.

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North American Aircraft Retirees Bulletin

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The "YE OLDE PHARTS BREAKFAST CLUB" meets in Orange on the 4th Thursday of the month at 10:00 AM. Among the stalwarts are the following from 1. to r.: Jim Greenwood, Bob Chavez, Stan Thimakis, Don Metzger, Ralph Schonau, Roy Toyama, Ted Komori, George Snyder, Howard Cox, John Bednarski, Bill Landes, Frank Luis, Chuck Kincade, and Leon Braskamp.

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION Retirees Bulletin

Summer 2002

Inside: **THE LEGACIES LEFT BY NORTH AMERICAN AVIATION PART II** by John Moore
THE SEA TRIALS OF THE P-51D MUSTANG "SEAHORSE" by Ed Rusinek



Photo from the Norm Avery Collection

ON 14 NOVEMBER 1944, NAVY LT. BOB ELDER TOOK OFF FROM THE USS SHANGRI-LA (CV 38) IN A P-51D NAMED "SEAHORSE" FOR THE FIFTH AND FINAL TIME AFTER A 250 FOOT RUN INTO A 35 KNOT WIND AND RETURNED TO NAS NORFOLK.

NORTH AMERICAN AVIATION
Retirees Bulletin

NAAR BULLETIN, an affiliate of the **Bald Eagles, Inc.**, is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

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I am enclosing payment of $10.00 per year and I understand you will send a gift card to recipient.

DEAR NAA RETIREES BULLETIN SUBSCRIBER

We sent out two reminders which brought back many of our one year subscribers but we still lost two hundred. We have made up this loss with new subscribers so we have about 2800 paid subscribers including more than 300 SILVER EAGLES! And, once again we have some great articles and even some literary gems from our readers.

In 1950, there were very few jobs in the aviation industry and since I was graduating from the University of Michigan in January 1951, I was greatly concerned about my future. You can imagine my delight when the telegram arrived in November 1950 from the Aerophysics Laboratories of North American Aviation Inc. offering me a job as a Stressman B at the fabulous salary of $310.00 per month. There were only two offers made and the other went to a chap with a Masters degree. I didn't have a clue what Aerophysics Laboratories meant or where Downey, CA was located or what project I would be working on. None of that mattered. What did matter was that I would be working for the finest and most advanced aircraft company in the world! From the day I arrived in February 1951, my high opinion of the company called North American Aviation Inc. never faltered.

Therefore, you can imagine my surprise when NAA Management agreed to merge our "ahead of the state-of-the-art" technical company with one that never built anything more complex than a truck axle. However, having accepted the merger, it was an even greater shock to me to see the name North American Aviation disappear completely and the name Rockwell stand alone. When that happened, I felt like a member of the family died! I am sure that many of you have wondered as I did, "How could this have happened?"

In his final installment in this issue, John Moore tells us how it all transpired. It should be a "must read" article for all MBA students. A trusting Lee Atwood listened to suggestions made by Al Rockwell about restructuring the board of directors, which ultimately resulted in a forced early retirement for Lee and NAA becoming a "subsidiary" of the Rockwell conglomerate.

Were you surprised to see a P-51 Mustang on the cover, taking off from the deck of an aircraft carrier? I was. When I saw this event illustrated on the cover of "WINGS" magazine, I contacted the author and famous aviation artist, Mike Machat. He offered to write another article about this event but got editorially sidetracked in his purchase of "WINGS" and "AIRPOWER" magazines. Norm Avery came to the rescue with enough information to make this a great story.

Some retirees call our office in search of a fellow retiree to renew old friendships and ask for their address and phone number. We are sorry but our number of subscribers is small in comparison to the total number of NAA/Rockwell retirees still around. However, even if we do have the information asked for, we cannot and will not divulge it to anyone. However, we plan to publish a small directory at the end of the year with the names and addresses of all retirees that wish to be listed.

Until our next issue, stay healthy and may you always stand in the shadow of God's Blessing!

WHEN DOES YOUR SUBSCRIPTION EXPIRE?

Some of you subscribers have paid twice because you don't know when your subscription expires and you don't want to miss an issue. Check the date above your name on the address label (page 16). If it has December 2002, your subscription ends after the Winter 2002 issue. All subscriptions are by the year (four issues) and the year shown above your name will indicate when the subscription expires.

ATTENTION RETIREES RESIDING IN NEVADA!

Retiree Frank Pelteson, living in the Las Vegas area, has informed us that an insufficient number of you have expressed interest in forming a retiree social group and, therefore, he will no longer pursue this organizational effort. Since we know from our subscription list that quite a number of you have moved to the area, we are sorry that this project did not reach fruition.

COMING IN THE FALL ISSUE!

North American Aviation Trainers, The World's Best Training Aircraft

NAA/ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Bill Kelley at (714) 637-9374.

The Antelope Valley Retirees Club meets in the South Meeting Room of the Palmdale Culture Center at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell/Boeing retirees are welcome. For information, contact Bill "Tiny" Kisler at (661) 273-0213.

Boeing Valley Retirees Club meets on the 3rd Thursday of each month at the Canoga Park Rec Center, 8500 Fallbrook Avenue, Canoga Park, CA. The president is Jennie Muncaster at (818) 341-8919.

"The Old LAD Stress Group" meets for breakfast approximately every two months at Mimi's Café in Torrance, CA. If you are from the old LAD Stress Group contact Gene Laxton at (310) 378-3113 or Ed Rosenthal at (310) 375-8933.

"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meet at 11:30 AM on the 2nd Wednesday of the month for lunch at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd. and Mariposa Ave.

The NAA 101 Tooling Retirees Group meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at the Cimarron Café, 5160 190th St., West of Anza Avenue in Torrance, CA.

GPS Breakfast Club meets from 6:00 AM to 8:00 AM every Wednesday at the Primrose Restaurant, comer Seal Beach Blvd. and Westminster Blvd. All are invited. For more information, call Fred Shitara at (714) 750-1016.

Seal Beach Retirees Group meets at 11:30 AM on the 3rd Wednesday of the month at "The Fish Co." on Los Alamitos Blvd. at Katella Avenue. For more information call Marvin Blaski at (714) 848-5717 or e-mail to mblaski@aol.com.

The Facilities, Industrial Engineering and Plant Services Retirees Group meets at 11:45 AM on the 2nd Thursday of each month at Buster's (formerly Jolly Roger's) Restaurant in the Long Beach Marina. Contact Joe W. Mausser at (562) 596-5845.

Downey Engineering Group of Retirees known as the "Choir Boys" meets every Thursday for lunch at various restaurants from Downey to Seal Beach. Call Al Risi at (714) 892-5725 for meeting location.

"Ye Olde Pharts Breakfast Club" meets at 10:00 AM on the 4th Thursday each month for breakfast at Polly's Pies at 2025 N. Tustin Avenue in Orange. For information call Don Metzger at (949) 495-5374.

The North American Rockwell Retiree Club of McAlester, OK (a satellite of Tulsa, OK) meets at 10:30 AM on the 3rd Tuesday of every month at the Down Town Meeting Place. Call J. A. Darden at (918) 423-0706 for more information.

Tulsa & McAlester Retirees meet for breakfast at 8:00 AM on the 2nd Monday in March, June, September and December at the Ramada Inn, 8181 East Skelly Drive in Tulsa, OK. Call Harry Phillips at (918) 838-3716.

The North American Rockwell Retirees Group of Columbus, OH Engineers and professionals meet at 11:30 AM on the 3rd Thursday of each month at the Berwick Park House. Contact Byron C. Solomides at (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH meets at Noon on the 1st Monday of the month at the Old Rockwell Park on North Hamilton Road. Contact E. Hamilton at (740) 927-5940 for information.

Autonetics Group including Marine Systems, Program Office, Project Office, System Test, Engineers and Designers meets for lunch on the last Wednesday of each month at the HomeTown Buffet, Rose Avenue and Alta Vista Drive in Placentia, CA. Call Mike Vohs at (714) 762-1925 for more details.

Autonetics Industrial Engineering and Maintenance Retirees meet for lunch on the 1st Thursday of each month at the HomeTown Buffet, 390 McKinley, located in front of the Home Depot, in Corona, CA. For more details, call Don Burt at (909) 698-0072.

Autonetics Flight Control Retirees meet at 11:30 AM on the 3rd Thursday of each month except December at "The Lamppost Pizza House" located at 17568 Yorba Linda Blvd., corner of Richfield Road, in Yorba Linda, CA. Call Jim Anderson at (714) 779-5620 for details.

Autonetics Retirees meet for lunch at 11:45 AM on the 2nd Wednesday of every month, alternating between the Rembrandt Restaurant, 909 E. Yorba Linda Blvd., Placentia, CA and the Yorba Linda Country Club. All Autonetics retirees, spouses and friends are invited. Contact Robert Nease at (714) 971-7870 or e-mail to rfnease@email.msn.com or Ed Venanzi at (714) 779-5652 or e-mail to EdVennz@aol.com.

A Group of NAA Retirees meets for breakfast at 8:15 AM on the 1st Wednesday of each month at Knott's Berry Farm-Chicken Restaurant. All are cordially invited. Contact Maxine Haun at maxa3131@aol.com.

Autonetics Financial Luncheon Group meets for lunch at Noon on the last Wednesday of the month at Carrow's located at 100 N. State College in Fullerton. Contact Ken Cantwell at (714) 970-7171 or Kcantwell@prodigy.net.

A Group of Engineer Mgt. meets at 11:30 AM on the 3rd Tuesday of the month for lunch at Denny's on Imperial Hwy and the 57 Fwy. Call Ed Moran at (562) 697-9949 for information.

NAA Tech Reps Assn. (TRA) Breakfast Club meets at 9:00 AM on the 1st Tuesday of each month at the Carlsbad Airport Restaurant. For more information, call El Presidente Rafael Colunga at (760) 940-0525.

Material Group retirees from Downey and Seal Beach meet at 11:30 AM on the 2nd Wednesday every month at various restaurants. Contact Joan Dominguez at (562) 865-7200 or e-mail to tatedom@aol.com for location.

ANNUAL EVENTS

Grants Pass Picnic - Held the 1st Wednesday after Labor Day, September 4, 2002 at Indian Mary Park. Contact Bob Morse at (541) 474-1438 or e-mail to lindabob@internetcds.com.

NAA-K B-25 Reunion - Will be held on August 18, 2002. For more information, call Harry J. Desko at (913) 287-7223 or write to him at 3024 N. 47th St., Kansas City, KS 66104.

Flying Horsemen - For the year 2002, the annual reunion will be held on Tuesday through Thursday, September 17th through 19th at Konocti Resort amd Spa, Kelseyville, CA. Contact Bob or Linda Morse for reservations at (541) 474-1438 or e-mail to lindabob@internetcds.com.

The Hangar Gang - This group of retirees meets approximately every 6 months. For time, date and other details, call Gene Salvay at (818) 788-3974 or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

Annual Flight Test Instrumentation Reunion - This group of retirees meets annually at the Fullerton Elks Club. For information, call Frank Vigil at (562) 691-0236.

Tech Rep Association - A group of retired Field Service Technical Representatives has a yearly picnic in June at a park in Fallbrook. For more information, call TRA President Rafael Colunga at (760) 940-0525 or e-mail to rafael@nctimes.net.

The Annual M&P, P.D.L, "Friends Christmas Luncheon" - This group of retirees and employees have assembled in mid-December for a festive luncheon and gabfest for the past 19 years. Those wishing to participate and receive notice of the next December luncheon call Fred Koeller at (310) 545-8854.

2002 Group Reunion Luncheon for TRI-STATE members - This group will meet on Friday, October 11, 2002 at 11:00 AM to 3:00 PM at the Desert Inn, 44219 Sierra Hwy., Lancaster, CA. For reservations call Bill Bright (661) 943-7276/bbright@antelcom.net, Jim Beall (661) 945-1326/jjbell@as.net, or Steve Carlson at (661) 944-9698/ stvnvee@rglobal.net.

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RONALD AMLAND
KEITH V. ANDERSEN
JOHN A. ANDERSON
NEIL R. ANDERSON
JOHN R. ANDRES
JACK AOKI
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STANLEY M. BARAUSKAS
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FRANK H. BECKMAN, JR.
BOYD H. BECKNER
JACK BEIGLE
M. W. 'JACK' BELL
KARL H. BERGEY
GEORGE BIGENHO
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DOMINIC F. BIRGEN
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• *SILENT MAJORITY*

The Sea Trials of the P-51D Mustang "Seahorse"

by Ed Rusinek

It was not unusual in the later years of World War II to load Army Air Corps aircraft aboard "Jeep" carrier decks for transport to combat areas where they were unloaded by crane. This procedure appeared straight forward enough unless complications arose at the destination during the sea voyage. Catapult launching seemed the best solution of this potential problem and a number of land based Army Air Corps P-39, P-40 and P-47 airplanes were actually transported by carrier and launched by catapult. The catapult launch characteristics and requirements for each type of aircraft were predetermined by the Ship Experimental Unit (SEU), then qualified aboard ship. Located at the Naval Auxiliary Air Station, Mustin Field - scrunched within the boundaries of the Navy Yard, Philadelphia - the SEU was the forerunner of the Carrier Suitability Flight Test organization and was closely allied with the command organization at the Naval Air Test Center, Patuxent River, MD.

In 1944, a single P-51D-5NA, #44-14017, and a PBJ-1H (B-25H), #43-4700, airplane were modified for both carrier landing and catapult launching trials at sea. The modification to the P-51 was done by the SEU at Mustin and added less than 40 pounds to the basic airplane. A strengthened fuselage bulkhead was added to sustain structural loads on arrestment. The keel line of the airplane was extended aft a short distance to form a hook attachment point. Bolt-on catapult hooks were attached to the main landing gear struts. Air pressure in the main oleos was increased to inhibit transient rebound characteristics. Trials were initiated at Mustin using the arresting gear and catapults. Tests consisted of 25 landings and takeoffs, including some catapult launches. Since deck takeoffs were to be the principle launch mode, techniques and trim settings were defined. Due to time constraints, all flight tests on land and at sea were conducted by one pilot, Navy Lt. Robert Elder.

In Lt. Elder's own words, "Early on in test, it became evident that the airspeed band between minimum approach speed as defined by available rudder control and maximum engaging speed as defined by wind over the deck and aircraft structural tolerances was indeed narrow - to be exact, hard over right rudder occurred when stabilized at 82 mph in the approach configuration and structural limitations under specified hook loads peaked out at slightly less than 90 mph. I used 85 mph as target approach speed. Fortunately, the little lady exhibited marvelous speed control characteristics and even though operating at near minimum margins of directional and lateral controllability (limited by torque), waveoffs could be executed by judicious application of power."

"Landing attitude was the one critical factor most worthy of comment because of either premature main wheel contact with the deck prior to hook engagement or an inflight engagement prior to tail wheel contact would certainly have reconfigured the test plane and possibly the pilot."

"Visibility forward during the approach", Lt. Elder continued, "was quite good and caused no problem at all in alignment or landing the airplane. In fact, some of the radial engine fighters, notably the F4U and F6F with cowl flaps open, had considerably more restricted forward visibility and in any case, I simply made a turning approach almost to touchdown as was the practice at that time".

And, finally, a personal observation from Lt. Elder, "Although I have had the privilege of several 'firsts' in qualifying Navy aircraft aboard ship, none was more interesting or satisfying than my experience with the Mustang".

The PBJ-1H, #43-4700, was structurally modified for catapult launch and arrest retrieval by NAA's modification center at Kansas City and the gear was installed by the Navy at Mustin. Following required ground tests, the aircraft was approved for sea trials along with the P-51D and the Navy's new Grumman F7F-1. On 14 November 1944, the test airplanes flew in formation from Mustin to the Naval Air Station at Norfolk Virginia with the PBJ

The Sea Trials of the P-51D Mustang "Seahorse"
(continued on page 6)

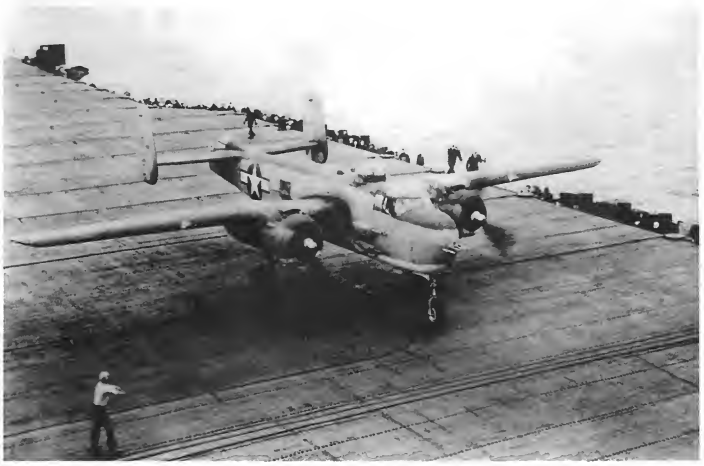


Photo from the Norm Avery Collection

PBJ-1H, #43-4700, was the single B-25 adapted for carrier trials. On 15 November 1944, Navy LCdr Bottomly made the first landing and catapult takeoff from the USS Shangri-La (CV 38) 90 miles east of Norfolk, Virginia.



Photo from the Norm Avery Collection

PBJ-1H, #43-4700, at the moment of touchdown and tailhook engagement of the arresting cable aboard the USS Shangri-La (CV 38).

The Sea Trials of the P-51D Mustang "Seahorse"
(continued from page 5)

piloted by a LCdr Bottomley with NAA field service reps Beaupre and Joe Schaffer on board, the P-51D flown by Lt. Elder, the F7F piloted by a Lt. Lane and a TBM flown by a Lt. Weimer — the latter carrying spare parts for the other three planes.

That afternoon, Beaupre and Schaffer, along with a large group of observers from the Navy and the Grumman representatives, were transferred to the carrier USS Shangri-La (CV 38). Since the ship was on a shakedown cruise, the fighter groups normally assigned to the ship were on shore duty, leaving the carrier void of any airplanes. The flight deck was over 900 feet in length and during a conference in the Officers' Mess, the NAA reps indicated that in a 35 knot wind (which the Navy promised) the P-51D would takeoff within 600 feet. That evening, the carrier headed out for open sea to allow full speed with plenty of room for maneuvering. The three airplanes were scheduled to come aboard about 11:30 AM in the following order: first, the P-51D, then the F7F and, lastly, the PBJ. A total of five landings were to be made by each plane and the PBJ was to be catapulted five times.

On this carrier, there were a total of 14 arresting cables, spaced approximately 25 feet apart as well as five barriers. At 11:30 AM, the P-51D was sighted and the carrier turned into the wind and picked up speed to effect a 35 knot wind down the deck. Lt. Elder flew very low over the carrier to study the layout and then circled for his approach. He made his approach at 90 mph and engaged Cable #2 on center, making a perfect landing amid cheers from the crew.

The plane was then pulled to the 700 foot line for takeoff. This first takeoff was far from perfect. After a 150 foot run, the plane veered to the left side of the carrier and passed directly over the heads of the crew members manning the guns. He was evidently unable to hold a straight course with full right rudder. Lt. Elder later admitted that in his excitement, he overlooked trimming the aircraft for takeoff. The second landing was identical to the first. The ship was moved to the 600 foot marker and the plane left the deck after a 250 foot run. The three remaining takeoffs and landings were perfect. The average cable run-out for each landing was 82 feet. The tail rise was negligible and the tail wheel never rose more than two feet off the deck.

Since the catapult tests had been so successful at Mustin, it was decided not to conduct catapult tests of the P-51D from the ship. The plane was placed on the elevator and lowered to the parking deck where it received praise from the ship's officers and men for an hour. The plane was then flown back to Norfolk.

While the P-51D was conducting the landing and takeoffs, the other aircraft were supposed to be circling the carrier. However, neither appeared. Finally, Lt. Weimer, arriving in the TBM, advised that the PBJ had returned to Norfolk because of engine trouble accompanied by the F7F. In view of the fact that the carrier schedule did not allow more than one day for these tests, it was imperative that the PBJ get back to the carrier as soon as possible or lose out completely. Around four o'clock in the afternoon, the F7F appeared, made the five landings and takeoffs without mishap and returned to Norfolk.

About dusk, LCdr Bottomley arrived, circling the carrier twice before making his approach. As he came in for the landing, the tension grew to a high pitch. The PBJ engaged Cable #4 on center, making a fine landing. The airplane was then pulled over to the H-4 catapult on the starboard side of the ship, where it was prepared for launch.

During these preparations, Joe Schaffer questioned LCdr Bottomley regarding the engine difficulties which forced him to return to Norfolk. He indicated that the oil pressure for the right hand engine had become dangerously low. The loss of this pressure was later found to be caused by the oil dilution solenoid sticking. It appears that on approaching the carrier, LCdr Bottomley inadvertently actuated the oil dilution switch instead of the arresting hook switch, causing the oil to thin out and the oil pressure to drop. The prop was then feathered and the ship flown back to Norfolk, where the problem was corrected and the oil replaced. The catapulting of the PBJ was very satisfactory at 73 mph.

The Sea Trials of the P-51D Mustang "Seahorse"
(continued on page 10)



Photo from the Mike Machat Collection

Navy Lt. Bob Elder lands aboard the Shangri-La after a one hour and forty five minute flight from NAS Norfolk. For this test, the Navy fitted a tail book to a stock North American Aviation P-51D, dubbed the "Seahorse".



Photo from the Mike Machat Collection

LCdr Bob Elder, serving as the XO of Squadron VF-5A, in the cockpit of a North American Aviation FJ-1 Fury, the squadron's first operational jet, during carrier suitability trials aboard the USS Boxer on February 10, 1948.

The Legacies Left By North American Aviation (Part 2)

by John R. Moore

Part II is the continuation of the North American Aviation story begun in the Spring 2002 Issue of the Bulletin. John describes the successes and failures at Autonetics and his eventual move to Corporate. He explains our merger with Rockwell Standard with North American Aviation as the surviving company, only to have Lee Atwood forced to retire and the merged name of North American-Rockwell replaced by Rockwell International.

As mentioned in my first article, Minuteman II was the first operational program to use Integrated Circuits (ICs). At one time in 1964, I was told that virtually half of the ICs manufactured in the world were coming to Autonetics. This was an important factor leading Texas Instrument and Motorola into the IC business.

When Motorola's Dr. Lester Hogan took a number of engineers to Silicon Valley's Fairchild, he provided a major technology base for the formation of many of the founding companies of Silicon Valley. At the same time, Autonetics developed and produced five IC chip sets for the first hand held electronic calculators. These were built in the late 60's by Hayakawa (now "Sharp"). All of which shows the unsung NAA contribution to the genesis of the 20th Century microelectronic revolution.

During the 1960-1969 Defense Secretary McNamara era, the DoD adopted the policy of Fixed Price Total Package Procurement (FPTPP). This required competing contractors to make fixed price bids, not only for the R&D program, but for all planned follow-on production lots as well, which in some cases stretched 20 years into the future.

Since the FPTPP programs were the "only games in town", Autonetics undertook to retool our contracting, change control and engineering-customer disciplines to try to avoid the losses that our old methods of estimating and "engineers against the world" contact with customer engineers would have created. Obviously, the only way to survive was to write contracts tighter and more specific than ever before and to rely on payments for government-ordered changes to cover the inevitable cost overruns and schedule slips. We were also going to have to exert strict discipline to prevent our engineers from scheming with customer engineers to improve the products without formal and funded change contracts.

From previous experience, we knew that larger amounts of time and money could sometimes be expended trying to determine what changes if any to make than in actually making the changes, once they had been formally defined and agreed upon. Also, we were alert to the frequent failure to consider all of the secondary and tertiary effects and impacts of the changes, with additional costs and schedules not included in deciding what changes to make and in pricing the change proposals.

This caused us to develop a "Chain Reaction Change Control System", which attempted to identify all such adjunctive effectivities and impacts, as well as making meticulous records of the costs and times involved with anyone working with the customer or under the customer's mandate to determine program cost effectiveness of proposed changes in deciding what changes should be made.

In the early 1960s, Secretary McNamara decided that all aircraft are enough alike that the same basic design should be applicable to both Air Force and Navy aircraft. Accordingly, in response to his directive, a competition was held for a joint USAF-Navy F-111 family of aircraft. General Dynamics (GD) of Fort Worth, Texas won the competition. The USAF and GD then set about procuring the aircrafts' subsystems, the largest and most expensive of which was, except possibly for the engines, the Mark 2 avionics system.

For Autonetics, the Mark 2 avionics system was a must win, if we were to avoid further extremely painful layoffs. Accordingly, we set up a Systems Subdivision under the superb leadership of Leo Killen with the able systems engineering leadership by Pete Kreider under him. We also applied our new contract, change control and engineering discipline policies and systems.

Autonetics won the program in June 1966. It involved avionics systems for the FB-111 bomber and the F-111D strike fighter. Autonetics supplied the radars, inertial navigation systems, computers, heads up displays, displays, controls and system integration for the F-111D and most of the avionics except the GE radar for the FB-111.

The original contract called for the establishment of a contractual technical base line six weeks after receiving the purchase order. However, with the USAF, GD and Autonetics all involved in defining the technical base line, it was not completely set until 284 days after the purchase order was received. During this period, all NAA personnel who were involved maintained detailed records of all calendar time, costs and man-hours spent at customer behest. Upon completion, Autonetics totaled up the costs and found that it was $200 million.

The USAF and GD protested that the cost to make the actual changes was only $24 million. But Bill Grimes who handled program planning and control had his people produce a two million element matrix covering all of the recorded customer instigated actions. Upon detailed Customer examination of one LRU (the Inertial Navigator), it was determined that the average cost per matrix element was $100. Consequently, the USAF Secretary, Harold Brown, agreed to settle for our $200 million.

In June 1966, in response to the DoD urging for a backup for Lee Atwood, I was selected to be NAA's Executive Vice President and a member of the NAA Board of Directors. The presidency of Autonetics was then passed to Dr. Norman Parker. In January 1967, Dr. Parker accepted a position with another company and Fred Eyestone became president of Autonetics.

In my new job, I spent most of the next six months learning about the key people, cultures, businesses, resource needs, problems strengths and weaknesses of the other six NAA divisions and the Science Center. The major program at NAA at the time was the Apollo moon landing program. The former Missile and Information Systems Division, now the Space Division under Harrison Storms, had won the Apollo command and service module contracts, plus the Apollo/Saturn second stage. The second stage was the most difficult stage to design and build because its fuel fraction was so high (as I recall, it was 92% of its total weight). Rocketdyne was also very much involved, providing all eleven of the main stage rocket engines plus numerous additional control and lunar lander rockets. Segments of the Space Division's structural and aerodynamic work were subcontracted to the Los Angeles Aircraft Division and some of the test equipment to Autonetics. At its peak, NAA employment on Apollo reached about 41,000 people.

The Legacies Left By North American Aviation

(continued on page 8)

The Legacies Left By North American Aviation
(continued from page 7)

I was also paying particular attention to the Los Angeles, Columbus and Tulsa divisions because Lee Atwood wanted to reestablish NAA as the world's leading military aircraft maker. The Columbus Division was a bidder, with a very advanced blended wing fuselage design, on the Navy's F-14 substitute for the F-111B program, won by Grumman; and was attempting to sell variants of the RA-5C. Columbus also had won the Navy/ Marine Bronco OV-l0A close support aircraft program on a FPTPP contract.

The Los Angeles Aircraft Division was completing the R&D program of the Mach 3.2 B-70, a truly outstanding advance in supersonic aircraft technology, having a maximum lift to drag ratio at Mach 3.2 of about 8:1. LAAD was also getting ready to bid on the new B-1 bomber and the USAF F-15 program scheduled for competition in 1969. It was the largest aircraft program in sight at the time and, therefore, considered a "must win" program for NAA.

As Executive V.P., I was also assigned by Lee Atwood to examine possible acquisitions which could leverage the NAA government developed technology for commercial applications. To do this, I developed a protocol for business planning and business opportunity evaluation which I have since written up, honed and expanded. This was characterized by carefully identifying at least three tiers of assumptions about factors pertinent to the business opportunity evaluation. These tiers involved effects that were the result of causes, that were the results of higher order effects, that were the result of higher order causes that were the result of even higher order effects. They also attempted to surface as many of what would usually be implicit assumptions as possible. This work was carried out informally with Marv Lang, a very good economist and business strategist whom we had working on such evaluations.

In the Fall of 1966, I was interviewed by a business publication for an article at which time I explained that NAA had lots of technology that was the result of government risk capital that no enterprise could authorize the resources to develop because of the combination of the risks, long time to return on investment and the large critical masses involved.

In response to the article, I received a call from Willard F. "Al" Rockwell asking that we talk about a possible merger with his Rockwell Standard Corp. Upon exploring the characteristics of his company, I decided that it would make sense to pursue this further and told Lee Atwood about it. As it happened, Lee Atwood and Al Rockwell were both scheduled to be on an industrialist tour down the Danube. From that time on, Al Rockwell set his sights on NAA and Lee and I became very interested in an acquisition or merger with Rockwell Standard Corp. A merger with Rockwell would give us a commercial outlet for some of our technology, especially that at Autonetics.

In the meantime, NAA was having substantial problems in a number of its businesses. The greatest threat to NAA came when after three years of intensive personnel buildup, the program management problems of a complex technical program elicited customer concerns and a management survey of the Space Division's management of the Apollo command and service modules, plus, the second stage engineering attempts to develop and design a rocket powered structure that was lighter and cheaper than any that had ever previously been built. The recommendations of an investigating panel called for the replacement of a number of key individuals including the Space Division president, Harrison "Stormy" Storms. However, Lee Atwood declined to accept the recommendations even though it was alleged that the NASA administrator considered giving the NAA elements of the Apollo program to Boeing, which at the time had only the Apollo/Saturn first stage.

In late January 1967, the first complete Apollo system on the launch pad at Cape Kennedy suffered a command module fire which killed three astronauts. To this day there is no acceptable theory of what caused the fire, but it is known that NASA directed a pure oxygen atmosphere at 5 psi as the standard operating condition inside the command module, whereas, unknown to the Space Division engineers, NASA had actually used a pressure of pure oxygen on the launch pad that was closer to 16 psi. Also, a previous strong recommendation by NAA that a mixture of oxygen and nitrogen should be used inside the command module was flatly rejected by the NASA program office.

The fire and subsequent NASA reaction finally forced Lee Atwood to replace Stormy with Bill Bergen from the Martin Company. Even so, the Apollo program suffered severe cost and schedule difficulties. This led Lee Atwood to put Ralph Ruud, in my opinion that era's best action executive and practical problem solver, on special assignment to rescue the Apollo program, which he did.

The Atomics International (AI) Division had been started under the leadership of Dr. Chauncey Starr. However, in the Fall of 1966, Chauncey left NAA and John Flaherty took over as the president of AI and, ably backed up by Hermann Diekamp, continued its work in the forefront of the Liquid Metal Fast neutron Breeder Reactor (LMFBR) design as well as other reactors, including the SNAP 8 spacecraft power reactor, super conducting cables and many other energy-related programs. However, the main objective of AI was to obtain the Atomic Energy Commission (AEC) contract to develop a utility sized LMFBR.

Unfortunately, we learned from an authoritative source that the head of the AEC reactor programs intended to consider no one but GE or Westinghouse as suitable for the award of the utility sized LMFBR. Since AI was losing $5 million to $7 million per year on its LMFBR development work and had no viable business opportunity for exploiting its leading position in LMFBR design, I got Lee Atwood's permission to try to sell the LMFBR technology to Westinghouse for $35 million. This would have been a good deal all around, since Westinghouse was the prime candidate to win the impending AEC program for developing a 300 megawatt LMFBR to be placed at Clinch River, VA and NAA would have an $18 million capital gain. Westinghouse actually did win the Clinch River LMFBR, but it was canceled by President Carter, because he was afraid that the plutonium which it would breed could be stolen by terrorists to be used for nuclear weapons.

Also during this period, NAA was negotiating with Miehle Goss Dexter (MGD), a Chicago maker of printing machinery. Because of the recognition by MGD of the importance of the emerging electronic composing room equipment market, NAA was able to make a very good deal to acquire MGD, based on access to the Autonetics electronics, information systems and communication technologies. This acquisition actually took place after the NAA-Rockwell Standard merger which produced North American Rockwell (NAR) and continued to produce a very good return on the NAR investment for many years.

With the help of Morgan Stanley as NAA's investment banker, a deal was worked out for the Rockwell Standard merger, with NAA as the surviving corporation with Lee Atwood as the President and CEO, Al Rockwell as the Board Chairman and a new

Board of Directors composed of a combination of all of the directors from both premerger boards (12 from NAA and 12 from Rockwell Standard). The conditions of the merger had been agreed upon when we told Al Rockwell of our intention to sell the AI LMFBR technology to Westinghouse for $35 million. At the NAA Board of Directors meeting to approve this sale, a call came in from Al Rockwell saying that if we got rid of those AI assets, the merger was off. We tried to reason with him but AI was adamant. Consequently, we called off the Westinghouse deal and, in September of 1967, the merger between NAA and Rockwell Standard was completed.

The merged company was called North American Rockwell (NAR) and I was given the job as President of the former seven NAA divisions and the Science Center involving 94,000 people. This was called the "Aerospace and Systems Group" (A&SG). Meanwhile, Rockwell had hired Bob Anderson from Chrysler and he became President of the former Rockwell Standard divisions and Al's plethora of new acquisitions and subsidiaries, called the "Commercial Products Group" (CPG). Wally Booth was then brought in from the automobile industry as Chief Financial Officer (CFO). These two extremely competent executives and I were members of the Board of Directors and together with Atwood and Rockwell constituted the Executive Committee of the Board.

After the formation of NAR A&SG, I attempted to improve the A&SG organizational structure by bringing Donn Williams over from Autonetics as my deputy, hiring USAF Lt. General (ret.) Austen Davis as head of the three A&SG aircraft divisions and bringing Jay Wethe (who had actually been a propulsion expert in the USAF, GE and Marquardt) from Autonetics as head of a combination of Rocketdyne and AI into the "Power Systems" subgroup. Donn Williams and I, with Lee Atwood's direction and concurrence also set about installing a substantial number of new management programs designed to avoid cost, increase efficiency, optimize resource allocations, standardize certain management systems and improve venture analysis so that NAR A&SG avoided ventures, commitments and resource allocations which cost other defense, space and high technology contractors many, many billions of dollars in that era of the late 1960s and early 1970s.

As a result of these innovations and the very competent efforts of my staff, division presidents and their people, NAR A&SG never had a losing half year. Nevertheless, as the existing programs were winding down without enough opportunities to provide adequate new work, I endured the most painful task of my career and one which literally caused much of my hair to turn white. This was the requirement to maintain operating efficiency while cutting the A&SG population from 94,000 in September of 1967 to 60,000 at the beginning of 1970.



Photo courtesy of the Boeing Historical Archives

Using a NAVAN Navaho inertial navigator, the submarine USS Nautilus traversed the Bering Strait under the ice and surfaced at the North Pole.

About $35 million was indirectly and directly committed in trying to win the USAF F-15 fighter program in order to get the former NAA Aircraft divisions back into a major aircraft program. This involved marketing and proposal work at Columbus, to compete for the Navy F-14 and the heaviest effort, by far, on marketing, facility survey and proposal preparation for the USAF F-15. Toward this end, the A&SG aircraft engineers came up with technologically very advanced designs involving blended wing-fuselage architectures somewhat analogous to the present Concorde design. Unfortunately, we were underbid by about $400 million for the F-14 R&D program by Grumman.

The ultimate F-15 design had some high angle of attack wing tip vortex problems, early on, but these were solved by strakes and a change to the tail design so that the resulting aircraft was worthy of the NAA tradition. As part of our marketing policy, we were keeping our customer's consultants, NASA Langley engineers, apprised of both our problems and their solutions. We found out later that McDonnell Douglas allegedly scrapped their original design in June 1969 and adopted major elements of a design done by NASA Langley. Thus, we probably should not have been surprised that the NASA Langley engineers took heed of our vortex problems and forgot, or did not believe our subsequent solutions. In any case, the USAF announced on 24 December 1969 that McDonnell Douglas had won the F-15 competition with a lower bid than ours and other alleged superiorities.

Howard Evans, our extremely competent and creative advanced design director had been working on the advanced design of the B-1 bomber when we had lost the F-15 competition. The B-1 was to be an extremely advanced, state-of-the-art bomber, with low altitude survivability characteristics along with an intercontinental range and a 1000 mile or more supersonic dash capability. This dash capability provided quite a problem because the engine for such a long supersonic dash was substantially less than optimum for the subsonic legs of the mission. Similarly, the requirement for low altitude supersonic speed was operationally questionable and added substantial cost and technical difficulty to the system design.

Fortunately, Jack Hope, an engineer at Rocketdyne, came up with a plan for a dual bypass ratio engine which would allow us to optimize both supersonic and subsonic operations. He had already demonstrated the concept with two J-85 aircraft engines and we attempted to get the USAF to finance its development. Of course, President Carter canceled the B-1A program because Dr. Bill Perry, the head of DDR&E, became convinced of the great potential benefits of advances in stealth and the DoD's desire to apply them to a new bomber, to be called the B-2.

In September 1968, when the merger was a year old, Al Rockwell, who could be convincingly charming as any man alive, is reported to have approached Lee and said something like, "Our Board, with 24 members is too large to be effective. We are one company now and it is no longer a board made up

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The Sea Trials of the P-51D Mustang "Seahorse"
(continued from page 6)

Since it was becoming dark, it was decided to discontinue further testing and LCdr Bottomley was informed by radio to return to Norfolk. A short while later, he radioed that he was returning to the ship for an emergency landing. This time, the landing was very poor! He dropped the plane from height and engaged Cable #7 approximately 20 feet off center. Upon inspection, it was found that the reason for the emergency was because the left hand main landing gear auxiliary door had blown off shortly after launch. Further inspection of the aircraft revealed that the dash-pot for the arresting hook had been damaged from the hard landing and the left main gear tire was ready to blowout. Since the plane was too large for the elevator to handle, the plane was staked down on the flight deck and a replacement tire and tube were ordered from Norfolk, together with a wing jack. As soon as the tire and tube were replaced on the PBJ, the plane was catapulted and flown back to Mustin by a Commander Collins.

So ended the sea trials of the single P-51D and PBJ-1H equipped for carrier operations. Neither was produced in these configurations although both performed very well. Apparently, American gains in the Pacific in 1945 negated the necessity for this type of aircraft. Although never fully explained, the plan for the use of the Mustang seemed to be derived from the following concept. When the B-29 raids on the Japanese homeland were in the planning stages, the closest airfields were on the island of Guam — considerably beyond the range of available Army Air Corps fighter cover. The use of Navy fighters from the carriers as escorts would be an obvious signal to the Japanese that U.S. Navy carriers are operating in their homeland waters. Additionally, the much superior escort radius of the P-51D Mustang would allow greater standoff distance for the carriers. The capture of Iwo Jima and Okinawa in 1945 eliminated the need for this alternative and, thus, a totally new chapter in the history of the Mustang was never consummated.

Author's comment: this article was to have been written by the well-known aviation artist and author, Mike Machat. However, his new business venture has demanded all of his attention and he could not dedicate any time to this effort. He did, however, graciously lend us photos for the article. Fortunately, our outstanding retiree, author and authority on NAA aircraft, Norm Avery, reached into his vast resources and provided us the information and additional photos needed to produce the article. Thanks to both Mike and Norm, their assistance made this project a joy! — Ed

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The Legacies Left By North American Aviation
(continued from page 9)

of NAA and Rockwell Standard members, so I recommend that we reduce the size of our Board by having all members over 70 years of age retire."

Even before the merger, it had been recommended by a management consultant that the NAA Board be "modernized" by replacing all those over 70. Lee rejected the recommendation, pointing out that such a move would remove some of the Board's best contributors. However, this time, under the spell of Al's charm and because the Board was cumbersome with 24 members, Lee agreed to Al's proposal. This meant that five of the former NAA Board members would retire and only one from the former Rockwell Standard. Despite the fact that NAA was the merger's surviving corporation, the new Board now had 18 members, 11 from Rockwell Standard and only 7 from the former NAA.

The majority of Rockwell Standard members on the Board used the loss of the F-15 to remove Lee as CEO and to force him to retire. The A&SG was disbanded and its divisions were reassigned to report to Bob Anderson. I and all of the top people whom I had brought to NAA except Donn Williams were forced and/or chose to leave the company. Donn was made President of Autonetics. It now became clear that the nominal acquisition of Rockwell Standard by NAA had been a "Trojan Horse".

I joined McDonnell Douglas as Vice President of Subsidiaries. In the July 12, 1972 issue of Business Week an article appeared purporting to be an interview with two Rockwell International executives titled "Aerospace Copies Detroit". Mr. McDonnell circulated copies of this article which inaccurately impugned NAA's former management with old truths, half truths and untruths. I wrote a rebuttal giving the lie to some twenty allegations in the interview. This rebuttal stands today as an affirmation of the unique effectiveness of NAA's management.

Thus, the book was closed on America's premier high technology aviation and aerospace company with the most respected name of North American Aviation, Inc. becoming a footnote on the pages of history.

RESTORING AN RA-5C "VIGILANTE" IN FLORIDA

Sanford, Florida was the home base and training center for the RA-5C multi-sensor intelligence system used by the U.S. Navy. The system played a significant role during the Vietnam conflict, providing important all-weather visual data as well as simultaneous position-coordinated electronic intelligence.

The City of Sanford along with many Navy retirees that were assigned to the "Vigilantes", have embarked on a program of restoring the history of the local base and its "Vigilante" operations. Funds have been raised to obtain an RA-5C for display and to start a museum about the base. An RA-5C was obtained from a Navy test facility located at Inyokern, California. After much effort, it was disassembled and trucked to Sanford, where it is being cleaned up and reassembled for display at the main entrance to the airport. There is now a special Vigilante room in the airport to display the history of the base with plans for an adjacent museum.

This looks like a good project for some of our many retirees residing in Florida. Why not give the folks at Sanford a call and pitch in with your expertise?

CONGRATULATIONS and MUCH HAPPINESS to

Frank and Nola Affinito of Las Vegas, NV on their 62nd Wedding Anniversary

Contrails From The Past

by Ed Rusinek

Dear Ed.

The week that the NAA Retirees Bulletin came out, Ken took a very serious turn for the worse. We rushed him to the ICU at St. Mary's Hospital and on April 1, 2002, he passed away. The Willow Lake Care Center did not tell us if there were any calls or cards as a result of your appeal. I found out later that many people did try to communicate with us and to them, our family and I are very grateful. We would have been married 58 years at the end of this month.

—Martha West, Long Beach, CA

Ed's Resp.:You have our most heartfelt sympathy Martha; but yours is a love story that lasted 58 years. Think of all those happy moments.

Dear Ed,

Just a note to let you know how much we enjoyed the Winter Issue 2001; especially the X-15 "Fastest Flight of Them All" article and the "Joint Zero Launch and Wheels Up Landing" story.

Here in Tucson, we have the Pima Air & Space Museum adjacent to Davis-Monthan AFB, with five huge hangars filled with vintage aircraft. Among the hundreds of aircraft on display, there are at least a dozen from NAA/Rockwell including a full scale mockup of the X-15A-2, the RA-5C (A3J-3P), F-100C, F-86H, F-86L, and the first of only three built F-107As. The museum is well worth visiting and should bring back lots of memories.

Keep the bulletin coming!

—Rex K. Conrad, Tucson, AZ

Dear Ed,

The "Joint Zero Launch and Wheels Up Landing" article in the Winter Issue 2001 implied that the program ended with the flight where the rocket motor failed to drop off. That was not the case.

In the mid-1950s, NATO became concerned with the possibility that the Soviets could obliterate Allied aircraft sitting on the ground in a surprise attack. One of the potential solutions was to disperse the aircraft in hardened shelters away from conventional airfields with the capability of being launched by rockets from special platforms. The concept was known as Zero-Length Launch or ZEL for short.

Two F-100Ds (56-2904 and 56-2947) were loaned by the USAF to conduct the ZEL tests. NAA's Rocketdyne Division developed the solid-fuel rocket motor that would be attached to the bottom of the rear fuselage. This engine was capable of delivering a thrust of 130,000 pounds for four seconds. This was sufficient to accelerate the F-100D from zero to 300 mph in four seconds. Following burnout, the motor would drop off, leaving the aircraft free to fly.

The first live launch took place on March 26, 1958 at Edwards AFB. Test pilot Al Blackburn climbed into 56-2904, started the engine, pushed the throttle to full afterburner, then lit the rocket motor. Within four seconds, he was flying at 300 mph. The rocket booster dropped off, and Al Blackburn entered the standard pattern and landed.

On his second flight, things went wrong and he had to eject. However, the remaining of the total of 20 launches were incident-free with the aircraft carrying standard underwing stores, including dummy nuclear weapons.

To simulate takeoff from a "hard site"-bomb-proof bunker-Blackburn made the world's first "indoor" launch from a ramp inside a building at Holloman AFB in New Mexico on August 19, 1959. Although the system was reliable and simple to operate, it was never deployed operationally. I've dug up some photographs from those days which I am enclosing.

I joined NAA in 1940, went into the Navy in 1943, came back in 1946 and retired in January 1982.

—John F. Mirosh, Manhattan Beach, CA

Ed's Resp.: Thank you, John, for a great follow up. Your historical pictures are an editor's dream and we are publishing some of them here and now.



Photo from the John Mirosh Collection

Al Blackburn in final preparation for launch off the ramp inside a building at Holloman AFB. The ramp was designed for the plane to be airborne after a total takeoff run of three-eighths of an inch.



Photo from the John Mirosh Collection

Al Blackburn making the first indoor takeoff from a building simulating launch from a hardened shelter at Holloman AFB on August 19, 1959.



Photo from the John Mirosh Collection

The Flight Test Crew perched on the edge of the launch ramp inside the simulated "hard site" and overshadowed by the test F-100D. Fred Munz was the project engineer.

THE 40TH BALD EAGLES ANNUAL REUNION - APRIL 13, 2002



Val Yarbrough welcoming everyone



Al Kustra and Glenn Penner



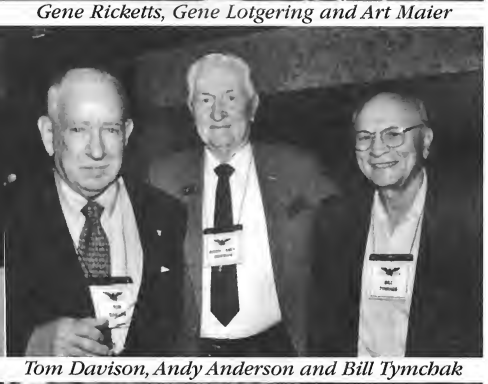
Gene Ricketts, Gene Lotgering and Art Maier



Maurice Murray and Pat Patterson



Cathy Boot, John Tranchina and Jo Tranchina



Tom Davison, Andy Anderson and Bill Tymchak



Curt Lappen and Ed Rosenthal



Neel Weeddle, Gloria Farquhar and Walt Jones



Don Wegner, Vinnie "Smokey" Pinzon and Jim Ball



Juanita Feltz, Charles Feltz and Lee Norwood



Lou Tiberio, Carl Elyash, Tom Klomparens and Ken Gallagher



Susan Cohen, John Hollingsworth and Sharron Brundige

SENATOR WM. J. "PETE" KNIGHT
CALIFORNIA LEGISLATURE
SEVENTEENTH DISTRICT

Dear Ed:
I really appreciated the 4 copies of the NAAR newsletter – brings back good memories.
Thanks again
Pete
Pete X-15, B-25, T-6, P-51

A letter of appreciation to Ed Rusinek from California Senator Pete Knight

The Silent Majority

by Stan Guzy



VIRGIN, EDWARD, 96 - died of renal failure on March 27, 2002 at his home in Chevy Chase, MD. Ed first came to NAA as an USAAC inspector after serving in a bomber squadron. In February 1941, he joined NAA as a test pilot and was, subsequently, promoted to chief test pilot and later elevated to chief of engineering flight test for NAA in California. He directed the efforts of NAA test pilots in the development of WWII aircraft and made many of the significant first flights including the B-25C, XB-28, XP-51G, XB-25G, XP-82, Navion, RAF NA-73 and subsequent P-51 Mustangs, B-25H, XB-25E and the B-25J. At the end of his flying days in 1950, Ed was placed in charge of the NAA Washington D.C. office. We were informed by fellow test pilot, Al Blackburn.

BACCANTI, JAMES, 74 - died April 28, 2002 of lymphoma in La Habra, CA. Jim worked as a mechanical engineer at NAA/RI/Boeing.

BENNETT, JUDITH "JUDY" S., 58 - passed away October 27, 2001 in Los Angeles, CA. Judy started at LAD in 1972 as a "Kelly Girl" and worked her way up to a technical position in Systems Engineering, Interface Management. Her husband, Norm, was also in Engineering.

BETHEL, CECIL "SKIP" B., 58 - a retired administrator at NAA/RI/Boeing, Skip died on April 19, 2002 of a heart attack. He is survived by his loving wife, Gail. Sent in by Maxine Haun.

BIERNACKI, PHILIP, 75 - passed away on February 5, 2002. Phil worked at RI and Northrop Grumman before he retired in 1993. He is survived by his loving wife, Dee. Sent in by Val Yarbrough.

BRADFORD, PATRICK "PAT" J., 65 - died in Los Angeles, CA on August 2, 2001. Pat started at LAD in the early 1960's as an Electromagnetic Compatibility Engineer and rose to B-1B Chief Project Engineer before he retired in the late 1990's to pursue his passion for playing bridge. Reported by Charlie Chin.

BUCHANAN, JAMES "BUCK", 67 - died of cancer in Yucca Valley, CA on February 27, 2002. Buck had 34 years of service with Autonetics and Collins. Reported by Dorman Reeves.

BUSH, CLARENCE A., 84 - succumbed on March 6, 2002 at Liberty Lake, WA where he resided since 1991. Clarence worked in aircraft design and manufacturing for 50 years and was assigned to Flight Test Operations at Edwards AFB and Palmdale, CA. He is survived by his loving wife.

BUXTON, ELLIOT "BUCK", 76 - died of cancer in his home in Huntington Beach, CA. He started at Downey in 1950, after graduating from Oregon State, in the Flight Control Group before becoming the Chief Engineer of the Autonetics Minuteman Division. He suffered a debilitating stroke in 1977 and retired in 1990. We were informed by Bob Nease.

CANNOM, JAMES E., 77 - died in February 2002 at the Ramona Manor Nursing Home in Hemet, CA where he lived for the last 25 years. Jim served as an electrician at the Autonetics facility for 15 years. He is survived by his loving wife, Doreen. Sent in by Gene Somers.

CARPER, GRACE L., - bulletin was returned to sender stamped "deceased".

CATTIVERA, JACQUELINE "JACKIE", 65 - died of cancer on October 7, 2001 in Vista, CA. She worked in Central Duplicating at LAD and Corporate Graphic Arts before retiring from Downey in 1993. We were informed by her good friend Violet Buraglio nee Sorenson.

CHASTAIN, TERRY W., 61 - passed away on September 11, 2001 in Huntington Beach, CA. Terry started at LAD in 1972 and worked in Interface Management and Engineering Specifications for 20 years. We were notified by Charlie Chin.

COBB, JOE, 85 - died in Santa Ana, CA of natural causes. The "Fat Kid" appeared in 86 "Our Gang" comedies. During WWII, he joined NAA as an assembler and retired in 1981. From a newspaper obit.

COWITZ, SAMUEL A., 79 - died on April 7, 2002 in San Luis Obispo, CA. Sam was a resident of Morro Bay, CA. He was an Autonetics employee assigned to the government warehouse department. He is survived by his loving wife, Mary. We were informed by William Sessa.

CROCKETT, ROBERT S., 96 - passed away peacefully from natural causes on May 6, 2002. Bob worked at NAA/RI from 1937 to 1972, a total of 35 years. During WWII, he served as a general foreman in Production Control. After the war, he worked as a staff assistant to the Factory Manager and later in Plant Engineering. We were informed by his son, Bob Crockett Jr., who also retired from NAA/RI.

CURCI, RAYMOND L., - passed away on April 12, 2002 in Fullerton, CA after a lengthy bout with prostate cancer. Ray began his career at the Aerophysics Lab of NAA and worked for many years in the Flight Control Group. He was a program manager at his retirement in the 1980's.

DAIGNEAULT, ARMAND M., 75 - died in October 2001 at the Hemet Valley Medical Center where he lived for the last 16 years. He was an electrician at LAD for 30 years. We were notified by R. F. Williams.

DOWNEY, BYERS "JOHN", 74 - died on April 11, 2001 as the result of a tragic accident. John was employed at NAA/RI as an inplant traffic supervisor for over 30 years and resided in Simi Valley, CA since 1963. He leaves his loving wife of 52 years, Martha. Notice by Jack Cavanaugh.

EDZIAK, TED - passed away on August 21, 2001 in Napa, CA. His wife, Virginia, preceded him in death on May 20, 2001.

ELKIN, HUGH W., 84 - passed away on April 1, 2002. Hugh was a long time employee and was a driving force on the F-100, X-15 and the B-1. He was a member of the American Defense Preparedness Association and the National Advisory Board of the American Security Council. He retired in 1981 to pursue his passion for skiing. Information sent in by Al Kustra, Howie Burhop and Phil Reardon.

EMORY, GRADY F., 83 - died March 13, 2002 at the Jerry L. Pettis Memorial Veterans Hospital in Loma Linda, CA. He had been a security guard in Anaheim, CA for 20 years and was a resident of Sun City, CA for the last 14 years.

FLOR, LAWRENCE "SONNY" C., 68 - died on April 29, 2002 at his home in Las Vegas, NV after a long and heroic battle with cancer. Sonny retired in 1990 after a distinguished career in Contracts and Pricing. He is survived by his loving wife, Betty, and three sons.

***Silent Majority** (continued on page 14)*

Silent Majority (continued from page 13)

FLORES, EUGENE J., 79 – passed away on February 26, 2002 in Brea, CA. Gene retired after 41 years as an aerospace machinist having worked at Aerojet General and RI, his last project being the Space Shuttle. He is survived by his loving wife of 53 years, Soledad.

GAINEY, VIRGINIA "GINGER" E., 71 – died in Fullerton, CA on January 19, 2002. We were notified by her loving daughter, Sherry.

GAYNOR, HENRY "HANK" J., 71 – passed away at his home in Hawthorne, CA on April 18, 2002. Hank came to LAD in 1976 after an outstanding military career where he earned many commendations, including the Distinguished Flying Cross (DFC). He served as a B-1B Interface Manager until his retirement in 2001.

GILLETT, EDGAR L., 81 – died March 17, 2002 of natural causes. He was employed as a machinist on various projects, including Apollo and Space Shuttle. Edgar was a Pearl Harbor Survivor. He is survived by his loving wife, Margaret.

GREEN, MARION L., 82 – died at Good Samaritan Hospital in Los Angeles, CA in early 2002. She was a circuit board inspector at LAD for 22 years.

GUZMAN, JOSEPH "CUYO" J., 70 – died on March 24, 2002 of sigmoid valvulus. He was a retired manufacturing engineer and is survived by his loving wife, Hortencia.

HAGER, GEORGE D., 80 – died on April 2, 2002 at a Templeton Care Facility. He worked as a Quality Engineer for 35 years before retiring in 1982. George resided in Paso Robles, CA and is survived by his loving wife Margaret.

HARRIS, WILLIAM E. SR, 78 – passed away on May 4, 2002 in the Hemet Valley Medical Center. He was a production cost analyst for 33 years and resided in Hemet, CA for the last 12 years. Reported by R F. Williams.

HERMANSON, ARNOLD E., 85 – died at his home in Atascadero, CA after a long illness. Upon arrival from Norway in 1948, he joined NAA as a technical writer. He is survived by his loving wife of 64 years, Maria. From an obit sent in by Dr. John Herman.

ISAACS, BETTY J., 73 – died on March 11, 2002 of cancer at the Inland Valley Medical Center in Wildomar, CA. After a 20 year career with RI, Betty retired in 1986 and moved to Lake Elsinore, CA.

JACOBS, THEDA F., 97 – died of natural causes on April 9, 2002. She had been an accountant for RI. Sent in by Maxine Haun.

LEMAY, FREDERICK D., 74 – died on October 25, 2001 in Lancaster, CA. Fred worked at Atomics International, Rocketdyne and the B-1 plant in Palmdale, CA as a Senior Industrial Engineer until he retired in 1984. He is survived by his loving wife, Ruth. Sent in by J. F. Lovenduski.

LEE, EDWARD S., 86 – died on April 6, 2002 at his home in Hemet, CA. Ed was an electrician at LAD for 30 years. Sent in by R F. Williams.

LEONHARDT, NANCY J., 58 – passed away on April 20, 2002 after a lengthy illness. She worked in Contracts and Pricing at Autonetics for more than 32 years upon retirement.

LEWIS, CLAUDE L., 76 – passed away on August 13, 2001 from heart failure at St. Joseph's Hospital in Orange, CA. We were notified by his loving sister, Janis Davidson.

LINTON, H. WOODROW "WOODY", 88 – died in Newport Beach, CA on December 1, 2001. He joined NAA in 1942 as an Industrial Engineer. In 1960, as Plant Engineer, he directed the relocation of the Autonetics Division from Downey to Anaheim. He later was made Executive Vice President and General Manager of NAR's property management subsidiary, the Narland Corporation. He retired as Western Regional Director, F&IE after 36 years of service. We were notified by a friend, Amy Parker, nee Mericle.

LOGAN, JUDITA E., 55 – succumbed on March 10, 2001 in Los Angeles, CA. She came to LAD in the early 1970's and started in the Engineering Avionics section, moving later to the Project Engineering Group. She is survived by her loving husband and daughter. Sent in by Charlie Chin.

LOIACONO, CARMEL, 82 – passed away on February 18, 2002 in Palmdale, CA where he resided since 1954. He was employed by NAA as an aircraft mechanic until his retirement in 1984. Sent in by R. Culleton.

LOVTO, ANN A., 77 – a resident of Huntington Beach, CA, Ann died of cardiopulmonary arrest on October 24, 2001. She was an inspector at RI until her retirement. We were notified by Maxine Haun.

MAISEY, MARTHA L., 83 – died April 15, 2002 at the Amans Elderly Home in Hemet, CA. She was a secretary at Autonetics in Anaheim for 10 years. Sent in by Gene Somers.

MALE, RAYMOND E., 82 – succumbed in September 2001 at his home in Sun City, CA. He was a project administrator at NAA in Fullerton, CA for 40 years. Sent in by Maxine Haun.

MARTNE, I. T. JR., 78 – passed away on January 31, 2002 in Knoxville, TN. He spent most of his life working on space programs at RI. No further information is available.

MARTIN, ELGIN "BUD", 74 – died in Playa Del Rey, CA on December 14, 2001. Bud came to LAD in 1952 and worked on various programs, including the B-70, F-107, F-108 and the B-1B until he retired in the late 1990's. Sent in by Charlie Chin.

MATTHEWS, JACK, 84 – succumbed to a massive stroke on April 5, 2002 in Mission Viejo, CA. He began his career in Personnel at LAD in 1943. He moved to the Columbus Division in 1950 and returned to LAD in 1960. He, subsequently, moved to Autonetics where he retired as Vice President, Human Resources. Sent in by Maxine Haun.

MATTHEWS, JEANNE, 93 – died on April 12, 2002. She was employed in Labor Relations in Downey for several years. Sent in by Maxine Haun.

MAY, RALPH "PETE" E., 67 – died on March 20, 2002 in Kennewick, WA. Ralph joined NAA at LAD, later held several managerial positions at Space and at Hanford. He is remembered for a great work ethic. Notified by a friend, Bill Hotarek.

McGIBBON, JOHN F., 68 – passed away on March 17, 2002 in Anaheim, CA as a result of kidney failure. John worked at Rocketdyne where he developed a formula to retain Space Shuttle tiles from falling off when the vehicle reentered the atmosphere—a discovery so valuable that NASA awarded him an honorary degree.

McMILLAN, DONALD C., 86 – died on April 21, 2002 in Long Beach, CA from complications following a heart attack and stroke. He held a number of executive posts at NAA/RI over 20 years, including the Vice President of the Autonetics Division.

MILLER, JEAN B. JR., 81 – died on April 5, 2002. Retiring from the USAF, Jean came to NAA/RI and, in 20 years, completed a second successful executive career. Sent in by Maxine Haun.

MOHR, EMIL A., 83 – passed away in January 2002 at the Hemet Valley Medical Center. He worked at RI as a mechanic for 27 years and resided at Hemet, CA for 18 years. Sent in by Gene Somers.

MURPHY, JACK I., 83 - died on March 9, 2002. After earning degrees in Mechanical Engineering and Business, Jack worked at Rocketdyne for 25 years. Sent in by Joe Pirzynski.

NAGY, DONALD E., 77 - succumbed on February 28, 2002 at his home in Torrance, CA of prostate cancer. Don retired in 1986 after 32 years of service in the Stress Group at LAD. We were informed by his loving wife, Lorraine.

PAYAN, ELIZABETH A., 66 - died on March 12,2002 at the Inland Valley Medical Center in Wildomar, CA. Elizabeth worked at NAA/RI for 30 years before she retired in 1991. For the past 7 years, she lived in Murrieta, CA. She is survived by her loving husband, Rodolfo.

PERRY, NATHAN C., 62 - died of complications from emphysema on April 14, 2002. Nathan worked in procurement and traffic operations for NAA/RI/Boeing for 40 years before retiring in 1999. He lived in San Clemente, CA.

REESE, JAMES O. R., 63 - passed away on March 10, 2002 at his home in Murrieta, CA where he lived for the past 4 years. Jim was an electrical engineer at RI/Boeing for 40 years before he retired in 1999. He is survived by his loving wife, "Sherry".

RODENBERG, WILMA, 69 - died on February 22, 2002 of liver failure and further complications. Wilma worked at Rocketdyne for several years before marrying Roy and moving to Downey, CA. She was very active in the Space Division Golf Club and the NAA Red Cross Blood Bank drives. She is survived by her loving husband, Roy.

ROSCIA, JOHN J., 81 - died on March 27, 2002 at his home in Pacific Palisades, CA. He joined NAA in 1956 as General Counsel and retired as Senior Vice President and Advisor to the President. He was preceded in death by his wife, Betsy Taylor Roscia.

ROTHENBERG, ALVIN C., 84 - passed away on April 22, 2002 from pneumonia. Living in Orange, CA, he worked as a mechanical engineer for RI/Boeing. He is survived by his two sons.

ROWAN, MARY E., 87 - died of natural causes on April 17, 2002. She had been a secretary at Rockwell International and lived in Garden Grove, CA.

RUTH, DAVID, 81 - died on March 30, 2002 of natural causes. Living in Lake Forest, CA, David worked as a Logistics supervisor for NAA/RI.

SAWYER, DONALD "BUZZ" K. JR., 71 - passed away at St. Jude's Hospital in Fullerton, CA on May 3, 2002 of lymphoma. He retired from RI after many years of service and is survived by his loving wife, Judy.

SCHROEDER, ROBERT, 72 - succumbed to a heart attack on February 20, 2002. Bob retired in 1990 as a QA Procurement Manager after 31 years of service.

SCOTT, PATRICIA J., 59 - passed away on February 16, 2002 at her home in Lawrence, KS. She had been employed at Autonetics in Anaheim prior to returning to Lawrence, KS.

SIEDBERG, CHRISTINA C., 79 - died on May 7, 2002 of undetermined causes. She was an electronic assembler and resided in Lake Forest, CA.

STEELE, PAUL, 78 - died in Vista, CA on March 6, 2002. Paul came to NAA as an aerodynamist from Bell Aircraft, bringing Bell X-1 and X-2 experience which had a strong influence on the X-15 design. He worked for 41 years in Aerodynamics and Advanced Systems before retiring. Reported by a family friend, Jim Hurzeler.

STONE, WAYNE F., 70 - lost his battle with cancer on April 27, 2002. A resident of Manhattan Beach, CA, he worked in the LAD Stress Group for 30 years before retiring in 1988. He is survived by his loving wife of 49 years, Betty. Sent in by Eugene Laxton.

THOMPSON, FRED S., - died on December 22, 2001 in Palos Verdes Estates, CA. We were notified by Mrs. Glenn Thompson.

THOMPSON, RUSSELL R., 83 - died of natural causes on December 22, 2001 in Anaheim, CA. He was a design engineer at NAA/RI.

TINDLEY, ANDREW "ANDY" O., 72 - died on January 22, 2002. A resident of Torrance, CA, Andy worked at NAA/RI for 32 years before retiring. To readers of this bulletin, Andy will be remembered for his "Mail Bag" column. He is survived by his loving wife of 53 years, Ethel.

TITUS, PAUL V., 77 - succumbed to a heart attack on December 30, 2001. Paul started at LAD in 1949 as an aerodynamic engineer. He later transferred to Columbus in 1952, to Oklahoma City in 1970 and back to LAD in 1972. He retired in 1980. During WWII, Paul was awarded the Bronze Star. We were notified by Victor McLaughlin.

TOTH, JOHN, 88 - died on April 24, 2002 of Alzheimer's disease. John was a sheet metal fitter at NAA/RI and lived in Anaheim, CA. He is survived by his loving wife, Amelia.

TRIMM, WILLARD "PAT", 80 - passed away peacefully on February 9, 2002. Pat worked on several aeronautical projects during the 35 years he was at NAA/RI, including the first Space Shuttle. He is survived by his loving wife, Betty.

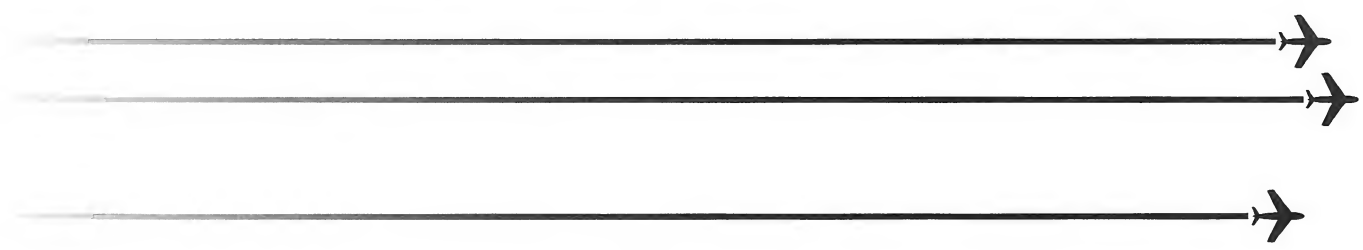
TWEEDIE, ARTHUR F., 74 - died on March 26, 2002 at his home in Prescott, AZ from lung cancer. He retired in 1983 after 32 years of service.

WALTERS, M. DONALD "DON", 91 - a veteran pilot and retired NAR test pilot, Don died on February 20, 2002 of pneumonia. He moved to Whittier, CA and worked at Autonetics in Fullerton, CA before retiring in 1975. He is survived by his loving wife, Gertrude.

WEST, C. KEN, 81 - succumbed after a long illness on April 1, 2002 at St. Mary's Hospital in Long Beach, CA. Ken worked at LAD, Downey and Autonetics as an electronics supervisor during his 38 years of service. We were notified by his loving wife, Martha.

WOLFE, CHARLES C., 85 - died of natural causes at his home in Grants Pass, OR on October 26, 2001. Charlie worked in the Hydraulics Design Group and Project Group for many years and retired in 1971. We were notified by his good friend, Bob Morse.

PAX DOMINI SIT SEMPER VOBISCUM



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North American Aviation Retirees Bulletin

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Photo from the Mike Machat Collection

A pensive Lt. Bob Elder prepares to launch from the deck of the USS Shangri-La (CV 38) for his return to NAS Norfolk and then on to Mustin Field, NAS Philadelphia. Note the sliding-block wheel chocks still used today.

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION
Retirees Bulletin

Fall 2002

Inside: **RESTORING THE FIRST F-107A** by William Simone
NAA TRAINERS – WINNING THE COMPETITIONS! by Frank Compton
THE WORLD'S LARGEST BIPLANE by Raymond Puffer



Photo from the Frank Compton Collection

THE T-28C, CIVIL REGISTRATION N2141D, RESTORED TO ORIGINAL NAVY PAINT SCHEME AND MARKINGS AND POWERED BY 1425 HP WRIGHT R-1820-86B ENGINE. AIRCRAFT WON BEST MILITARY TRAINER AWARD AT OSHKOSH IN 1983. AIRCRAFT OWNED BY FRANK COMPTON.

NORTH AMERICAN AVIATION
Retirees Bulletin

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DEAR NAA RETIREES BULLETIN SUBSCRIBER

Although our paths may have crossed at the Kennedy Space Center in the early days of the Apollo program, we had never formally met or shook hands. So when I called him about eighteen months ago to ask him to write an article for the bulletin, that was the first time we spoke to each other. He told me that he would love to do a story for us but that he was seriously ill with cancer and every single day was a battle just to function. As an alternative he suggested that we publish excerpts from his book THE WRONG STUFF. I obtained a copy and sat up until 2:00 AM because I just couldn't put it down until I finished reading it. We talked by phone weekly even after we printed several of his stories. He was a terrific storyteller with a ribald sense of humor and even laughed at some of my funny stories. As the months passed it was obvious that he was failing fast and our conversations became limited to a few words because it was hard work for him even to say a few words. On June 24, 2002, John Moore—Navy fighter pilot, Navy and NAA test pilot, survivor of countless aircraft mishaps, Apollo test conductor, proud Parent and Patriot—passed away quietly in his sleep at his home in Cocoa Beach, FL. We never shook hands but I shall miss you, "Old Friend".

We have received dozens of comments regarding our last issue, especially about the John Moore article about how we lost our name, North American Aviation. All of the comments have been favorable and we are pleased that the bulletin is serving the purpose it was meant to have.

In this issue we take up the story of our very successful NAA trainer aircraft. Frank Compton very ably gives us some insights on what it took to win the contracts even after the competition had already been selected. Having worked in preliminary design on many aircraft proposals, Frank provides a wealth of information on what it took to WIN! If you didn't win the contract, everything else was academic.

Who says that our publication has no romance? Our love story entails a young man who fell in love with an airplane in 1958 when his father, an NAA retiree, took him to USAF Plant 42 in Palmdale and he spotted an F-107A on the flight ramp. For William Simone, this love affair has never ended and he has paid dearly in time and money to keep it alive! But we will let him tell his story.

Until our next issue, stay healthy and stand in the shadow of God's Blessing!

THE "PEACEKEEPER" REUNION IN 2003

A 20-year reunion is being planned to be held June 18-21, 2003 in Santa Maria, CA to celebrate the First Flight of the Peacekeeper Missile (MX) which took place on June 17, 1983. Plans include a banquet, golf tournament and a tour of Vandenberg AFB. The committee is trying to determine the show of interest in this event. If you would like to participate, please contact Ed Venanzi, 6112 Foxfield Lane, Yorba Linda, CA 92886 or call (714) 779-5652. If more convenient, use e-mail at *EdVnnz@aol.com*.

WE ARE COMING OUT WITH AN NAA/ROCKWELL 2003 RETIREES DIRECTORY IN JANUARY 2003 – MORE INFORMATION AND SIGN-UP FORM IN THE BACK OF THIS ISSUE!

Man must rise above the Earth—
To the top of the atmosphere and beyond -
for only thus will he fully understand
the world in which he lives.

Socrates - 500 B.C.

NAA/ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Bill Kelley at (714) 637-9374.

The Antelope Valley Retirees Club meets in the South Meeting Room of the Palmdale Culture Center at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell/Boeing retirees are welcome. For information, contact Bill "Tiny" Kisler at (661) 273-0213.

BoeingValley Retirees Club meets on the 3rd Thursday of each month at the Canoga Park Rec Center, 8500 Fallbrook Avenue, Canoga Park, CA. The president is Jennie Muncaster at (818) 341-8919.

"The Old LAD Stress Group" meets for breakfast approximately every two months at Mimi's Cafe in Torrance, CA. If you are from the old LAD Stress Group contact Gene Laxton at (310) 378-3113 or Ed Rosenthal at (310) 375-8933.

"Aerodynamics, Thermodynamic, Propulsion and Wind Tunnel Retirees" meet at 11:30 AM on the 2nd Wednesday of the month for lunch at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd and Mariposa Ave.

The NAA 101 Tooling Retirees Group meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at the Cimarron Cafe, 5160 190th St., West of Anza Avenue in Torrance, CA.

GPS Breakfast Club meets from 6:00 AM to 8:00 AM every Wednesday at the Primrose Restaurant, corner Seal Beach Blvd. and Westminster Blvd. All are invited. For more information, call Fred Shitara at (714) 750-1016.

Seal Beach Retirees Group meets at 11:30 AM on the 3rd Wednesday of the month at "The Fish Co." on Los Alamitos Blvd. at Katella Avenue. For more information call Marvin Blaski at (714) 848-5717 or e-mail to *mblaski@aol.com*.

The Facilities, Industrial Engineering and Plant Services Retirees Group meets at 11:45 AM on the 2nd Thursday of each month at Buster's (formerly Jolly Roger's) Restaurant in the Long Beach Marina. Contact Joe W. Mausser at (562) 596-5845.

Downey Engineering Group of Retirees known as the "Choir Boys" meets every Thursday for lunch at various restaurants from Downey to Seal Beach. Call Al Risi at (714) 892-5725 for meeting location.

"Ye Olde Pharts Breakfast Club" meets at 10:00 AM on the 4th Thursday each month for breakfast at Polly's Pies at 2025 N. Tustin Avenue in Orange. For information call Don Metzger at (949) 495-5374.

The North American Rockwell Retiree Club of McAlester, OK (a satellite of Tulsa, OK) meets at 10:30 AM on the 3rd Tuesday of every month at the Down Town Meeting Place. Call J.A. Darden at (918) 423-0706 for more information.

Tulsa & McAlester Retirees meet for breakfast at 8:00 AM on the 2nd Monday in March, June, September and December at the Ramada Inn, 8181 East Skelly Drive in Tulsa, OK. Call Harry Phillips at (918) 838-3716.

The North American Rockwell Retirees Group of Columbus, OH Engineers and professionals meet at 11:30 AM on the 3rd Thursday of each month at the Berwick Park House. Contact Byron C. Solomides at (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH meets at Noon on the 1st Monday of the month at the Old Rockwell Park on North Hamilton Road. Contact E. Hamilton at (740) 927-5940 for more information.

Autonetics Group including Marine Systems, Program Office, Project Office, System Test, Engineers and Designers meets for lunch on the last Wednesday of each month at the HomeTown Buffet, Rose Avenue and Alta Vista Drive in Placentia, CA. Call Mike Vohs at (714) 762-1925 for more details.

Autonetics Industrial Engineering and Maintenance Retirees meet for lunch on the 1st Thursday of each month at the HomeTown Buffet, 390 McKinley, located in front of the Home Depot, in Corona, CA. For more details, call Don Burt at (909) 698-0072.

Autonetics Flight Control Retirees meet at 11:30 AM on the 3rd Thursday of each month except December at "The Lamppost Pizza House" located at 17568 Yorba Linda Blvd., corner of Richfield Road in Yorba Linda, CA. Call Jim Anderson at (714) 779-5620 for details.

Autonetics Retirees meet for lunch at 11:45 AM on the 2nd Wednesday of every month, alternating between the Rembrandt Restaurant, 909 E. Yorba Linda Blvd., Placentia, CA and the Yorba Linda Country Club. All Autonetics retirees, spouses and friends are invited. Contact Robert Nease at (714) 971-7870 or e-mail to *rfnease@email.msn.com* or Ed Venanzi at (714) 779-5652 or e-mail to *EdVennz@aol.com*.

A Group of NAA Retirees meets for breakfast at 8:15 AM on the 1st Wednesday of each month at Knott's Berry Farm-Chicken Restaurant. All are cordially invited. Contact Maxine Haun at *maxa3131@aol.com*.

Autonetics Financial Luncheon Group meets for lunch at Noon on the last Wednesday of the month at Carrow's located at 100 N. State College in Fullerton. Contact Ken Cantwell at (714) 970-7171 or *Kcantwell@prodigy.net*.

A Group of Engineer Mgt. meets at 11:30 AM on the 3rd Tuesday of the month for lunch at Denny's on Imperial Hwy and the 57 Fwy. Call Ed Moran at (562) 697-9949 for information.

NAA Tech Reps Assn. (TRA) Breakfast Club meets at 9:00 AM on the 1st Tuesday of each month at the Carlsbad Airport Restaurant. For more information, call El Presidente Rafael Colunga at (760) 940-0525.

Material Group retirees from Downey and Seal Beach meet at 11:30 AM on the 2nd Wednesday every month at various restaurants. Contact Joan Dominguez at (562) 865-7200 or e-mail to *tatedom@aol.com* for location.

ANNUAL EVENTS

Bald Eagle Reunion - The 41st Annual Reunion will be held on Saturday, April 12, 2003 at the Proud Bird Restaurant. Call Val Yarbrough at (805) 646-2283.

Grants Pass Picnic - Held the 1st Wednesday after Labor Day, September 4, 2002 at Indian Mary Park. Contact Bob Morse at (541) 474-1438 or e-mail to *lindabob@internetcds.com*.

NAA-K B-25 Reunion - Will be held on August 18, 2002. For more information, call Harry J. Desko at (913) 287-7223 or write to him at 3024 N. 47th St., Kansas City, KS 66104.

Flying Horsemen - For the year 2002, the annual reunion will be held on Tuesday through Thursday, September 17th through 19th at Konocti Resort and Spa, Kelseyville, CA. Contact Bob or Linda Morse for reservations at (541) 474-1438 or e-mail to *lindabob@internetcds.com*.

The Hangar Gang - This group of retirees meets approximately every 6 months. For time, date and other details, call Gene Salvay at (818) 788-3974 or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

Annual Flight Test Instrumentation Reunion - This group of retirees meets annually at the Fullerton Elks Club. For information, call Frank Vigil at (562) 691-0236.

Tech Rep Association - A group of retired Field Service Technical Representatives has a yearly picnic in June at a park in Fallbrook. For more information, call TRA President Rafael Colunga at (760) 940-0525 or e-mail to *rafael@nctimes.net*.

The Annual M&P, P.D.L., "Friends Christmas Luncheon" - This group of retirees and employees have assembled in mid-December for a festive luncheon and gabfest for the past 19 years. Those wishing to participate and receive notice of the next December luncheon, call Fred Koeller at (310) 545-8854.

2002 Group Reunion Luncheon for TRI-STATE members - This group will meet on Friday, October 11, 2002 at 11:00 AM to 3:00 PM at the Desert Inn, 44219 Sierra Hwy., Lancaster, CA. For reservations call Bill Bright (661) 943-7276/*bbright@antelcom.net*, Jim Beall (661) 945-1326/*jjbell@as.net*, or Steve Carlson at (661) 944-9698/*stvnvee@global.net*.

Contrails From The Past

by Ed Rusinek

Dear Ed,

The photo in the Spring 2002 issue of NAVAHO X-10 No. 1 during the first taxi test at Edwards AFB brought back memories and an old photo which I am enclosing showing how the vehicle was delivered to Edwards.

The photo was taken at Butler Hangar, located on the west side of the Long Beach Airport, off Wardlow Avenue. The X-10, No. 1, was loaded on an USAF trailer with special outriggers for the main landing gear. It was 70' long, 28' wide and 16' high. Being classified at the time, special tube framing was designed and attached to the trailer, then covered with tarpaulins to disguise the contours of the X-10.

The X-10 was surrounded by a convoy of vehicles as it was moved along a specific route that was previously approved by city, county and state. The first leg started after midnight down the main drag of the city of Bellflower. It was an awesome sight for the people to see this monster chugging down the street, especially for those leaving the local bars.

—Jack Cavanaugh, Las Vegas, NV

Ed's Resp.: Thank you, Jack, for a great postscript to the X-10 story! We are placing your graphic photo on our back page.

Dear Ed,

I am the son of Joseph D. Simone who worked for nearly 25 years at LAD on the XB-70, B-1A and B-1B programs. I read my father's copy of the bulletin and would like to inform you of the F-107A restoration project I am conducting at the Pima Air and Space Museum in Tucson, AZ.

My love affair with the F-107A began when my father introduced me to the plane in 1958 during a trip to the North American Flight Test Center located at the USAF Plant 42 in Palmdale, CA. Out on the ramp sat this very unique aircraft, unlike any I have ever seen before.

I have written and had published several articles about the F-107A. My upcoming book, a vastly expanded and updated revision of the articles and the result of forty-three years of research, is scheduled to be published this winter.

—William Simone, Lancaster, CA

Ed's Resp.: You have a wonderful story, Bill, about a great airplane and we are giving it separate billing in this edition of the Bulletin.

Dear Ed,

I enjoyed your article on the sea trials of the P-51D. I volunteered for the U.S. Air Corps in May 1942 and in June 1942 it was divorced from the Army and became officially a separate branch of the military as the USAF. I attended the NAA P-51 service school in Inglewood, CA in October 1942.

I was hired on at the NAA Columbus Division in 1952 after my tour of duty in the Korean War. So, you can see that I am a very dedicated NAA and P-51 fan.

Twice in your article you mentioned the Air Corps instead of the correct name of the U. S. Air Force. Please make note of this in your next bulletin.

—James E. Roberts, Victorville, CA

Ed's Resp.: You have a good eye for detail, Jim. Strictly speaking, the U.S. Army Air Corps was redesignated as the U.S. Army Air Forces (USAAF) on June 20, 1941 with General H.H. (Hap) Arnold in command. For, perhaps traditional reasons or to distance it from the U.S. Air Force (USAF) which Congress established in 1947, the U.S. Army Air Forces (USAAF) are still affectionately referred to as the Army Air Corps. Recall the closing lines of the famous Air Force song of WWII:

We live – in fame
Or go down – in flame, HELL!
Nothing can stop the Army Air Corps

Dear Ed,

John Moore's recent two-part presentation of "THE LEGACIES LEFT BY NORTH AMERICAN AVIATION" was clearly a masterpiece. His recall of people, places and events is astounding. I wish to thank him for the readers of the "Bulletin" for taking the time to chronicle the events that shaped our great company. These allowed NAA (and subsequent names) to enter the history books as the corporation with the greatest array of talent ever to work together, on the most challenging projects the modern world has ever known. When you look at the big picture, the achievements were phenomenal.

The conversion of the corporate name was a very sad issue, and many die-hard North Americans were very put out! My parents, who were NAA investors and huge NAA fans would attend the stockholder meetings. I remember them telling me of one meeting where a Rockwell International flag was displayed. The booing and hissing that followed was so loud, the flag had to be rolled up and removed. John Moore has explained the chain of events as to how that all came about. I always wondered. I was privileged to work for the Space Division in engineering roles for almost 32 years.

Very best regards, and thank you again, John Moore!

—Edward (Ed) Cohn, Fullerton, CA

Ed's Resp.: Even to this day, John is working on several projects and technical papers. We were honored by his willingness to share with us his insights of the events that led to our greatest successes and our, subsequent, downfall!

Dear Ed,

Dale and I enjoy the Bulletin so much, especially the recent articles about the P-51 Sea Trials and John Moore's report on how NAA became Rockwell International.

We are also so happy to hear that you are planning to publish a directory. We definitely want to be included in it. If any donations are needed for this endeavor, just let us know.

—Peggy Stinson, Hemet, CA

Ed's Resp: Thank you for your kind words. We have enclosed a form in this issue for those retirees that wish to be included in the directory. We have to charge a minimal fee to cover costs.

Dear Ed,

I just finished reading John Moore's "Legacies" article for the second time. I was fascinated to learn exactly how Rockwell got control. Until that happened, I looked forward to every day as "Another Great Adventure In Science". The 80-hour work

Contrails From The Past
(continued on page 15)

The World's Largest Biplane

by Dr. Raymond L. Puffer, Air Force Flight Test Center Historian

On 18 February 1977, just twenty-five years ago, a huge and unlikely shape lumbered off the main runway and into the sky. The shape was the Orbital Vehicle -101 *Enterprise*, firmly mounted atop a Boeing 747 Shuttle Carrying Aircraft (SCA), surely the largest single unit ever to fly in aviation history. The occasion was the initial captive-carry sortie of the non-orbiting prototype of the Space Shuttle, the first in a series of atmospheric flight tests that would culminate in the *Enterprise's* first independent glide flights and landings.

Edwards AFB was a natural choice to be the landing zone for the world's first reusable space vehicle. The clay surface of Rogers Dry Lake could easily sustain the Shuttle's weight, and its great size provided runways with immense safety overruns. NASA was the Responsible Test Organization (RTO) for the Shuttle Program, and the Dryden Flight Research Center was a longtime partner of the Flight Test Center. The AFFTC would obviously have an important role to play.

An immense amount of support would be required: fire and crash rescue, medical service, security, pacer aircraft, tracking and range support to name only a few. But the Center's role was not to be confined to facility support. The Air Force Space and Missile Systems Organization (SAMSO), through its Reusable Launch Vehicles (SPO), had tasked the AFFTC with overseeing the Air Force's involvement in the Space Shuttle Program. The Center therefore established the Office of Advanced Manned Vehicles and conducted Department of Defense oversight of the Shuttle's approach and landing tests.

Testing the mated vehicles began with low speed taxi tests on the main runway. These were conducted early in the morning to reduce heat buildup in the 747's tires and brakes. With a Shuttle weight of about 144,000 pounds added to the mother ship's weight of approximately 400,000 pounds, the forces acting on the brakes and steering function were immense. The taxi tests culminated with high speeds and the use of full braking, thrust reversers and speedbrakes to simulate an aborted takeoff.

When NASA pilots Fitzhugh "Fitz" Fulton and Thomas McMurtry took the SCA/Shuttle combination into the air for the first time, they discovered that the Shuttle had little adverse effect upon the 747's handling qualities. In part, this was due to the large tailcone that was fitted to the *Enterprise* for the five captive-inert flights. The Shuttle's wings also provided useful lift, leading some wags to maintain that the combination was unquestionably the world's largest biplane.

During the captive-active flight phase that followed, the space vehicle was manned by a two-person crew—astronaut Fred Haise and test pilot Gordon Fullerton. Three successful sorties led up to the *Enterprise's* first separation and free flight on 12 August 1977.

About the author: Dr. Raymond L. Puffer serves as our guest historian and is well known to our readers for his precise and succinct articles. In his role as historian for the AFFTC at Edwards AFB, he has provided the Bulletin an invaluable service for which we are totally in his debt. Thank you Dr. Ray.



Photo Courtesy of the AFFTC History Office

The 747/Enterprise combination at takeoff for the first of five captive-inert flights with tailcone. Tagged by "wags" as the world's largest biplane.

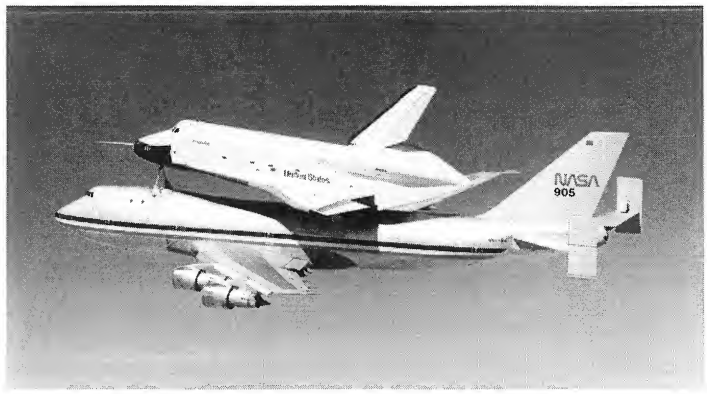


Photo Courtesy of the AFFTC History Office

The 747/Enterprise combination performing smoothly over Edwards Air Force Base with little adverse effect upon the 747 handling characteristics.

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NAA Trainers – Winning the Competitions!

by Frank Compton

Over the twenty-year period, 1935-1956, North American Aviation participated in three major trainer aircraft competitions, winning production contracts for the BT-9, T-28 and the T2J programs. Subsequent information provided by the Customer at post-award critiques confirmed that NAA's competitive edge, in each case, was due to the heavy emphasis on a superior ease of maintenance concept.

The BT-9

The 1935 USAAC basic trainer competition was won by the Seversky SEV-3XAR entry. The runner-up was the Curtiss-Wright model 19R. Both of these airplanes were sleek, all metal, full monocoque, closed cockpit configurations with speeds approaching 180 MPH. In contrast, the General Aviation Corporation entry was a dusted-off, fabric covered, open cockpit Navy model OJ-2 biplane. Seversky won the competition hands-down and received an initial order for 30 BT-8 basic trainer aircraft.

Just prior to the Seversky award, Dutch Kindelberger entered the picture during the transition of the General Aviation Corporation to North American Aviation. Dutch prevailed on the staff to prepare an unsolicited proposal for a contemporary design, mass producible trainer aircraft. One which would exhibit high rates of operational readiness, an area in which the BT-8 was judged to be deficient.

Dutch immediately pressed the Wright Field procurement office for a chance to compete with the Seversky BT-8 for a shot at the larger quantity, follow-on production order. With the unsolicited proposal in hand, Dutch went to Wright Field, promising the Army Air Material Command that an all new, scratch built, company funded trainer would be delivered to Wright Field for competitive flight demonstration within 65 days. The offer was accepted and Dutch returned to the Dundalk Maryland facility "to get the ball rolling."

As unbelievable as it may seem, the all-new NA-16 demonstration aircraft was completed, flight-tested, flown from Baltimore to Dayton under civil registry as NX-2080 and demonstrated during April and May 1935; all within the specified time. The NAA test pilot was Eddie Allen.

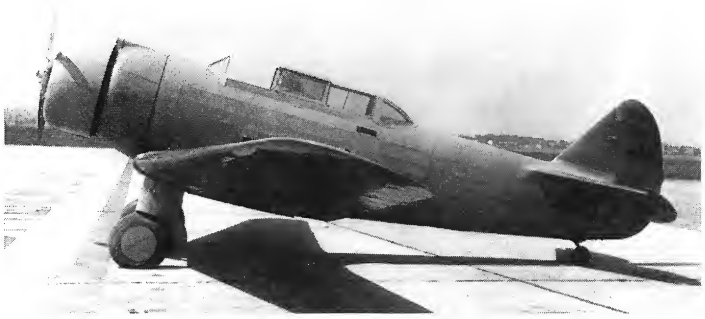


Photo from the Frank Compton Collection

The North American Aviation NA-16 demonstrator on the ramp at Wright Field, April 1935. Canopy was installed just prior to ferry flight from Dundalk, MD to Dayton, OH. The aircraft was powered by the 350 hp Wright R-975E-3 engine.

In January 1936, all of NAA's assets were moved from Maryland to California. This included the GA-15 (O-47) program, a seaplane float contract and all of the BT-9 engineering, tooling and manufacturing components. The BT-9 became the direct line progenitor of the many NA-16 models and variants to follow, including the Navy NJ-1, USAAC BC-1, the NA-44 attack demonstrator, the Harvard I, BT-14, SNJ-1, SNJ-2, the BC-2, BC-1A, the Harvard II, AT-6/SNJ standardized trainers and many export versions of the above listed series.

NAA's Contracts Department "zero" report called out each aircraft model by both charge number and by designation number. Thus, the basic trainer demonstrator BT-9 prototype charge number was NA-16, while the designation number was also NA-16. All subsequent trainer models and variants through the AT-6/SNJ's had consecutive charge numbers but retained the NA-16 category designator number. Confusing? Yes, indeed!

Accessibility/maintainability features designed and built into the BT-9 prototype proved their merit during ground support operations. These features became common to the NA-16 series lineage. By removal of quickly detachable side panels, cowl-

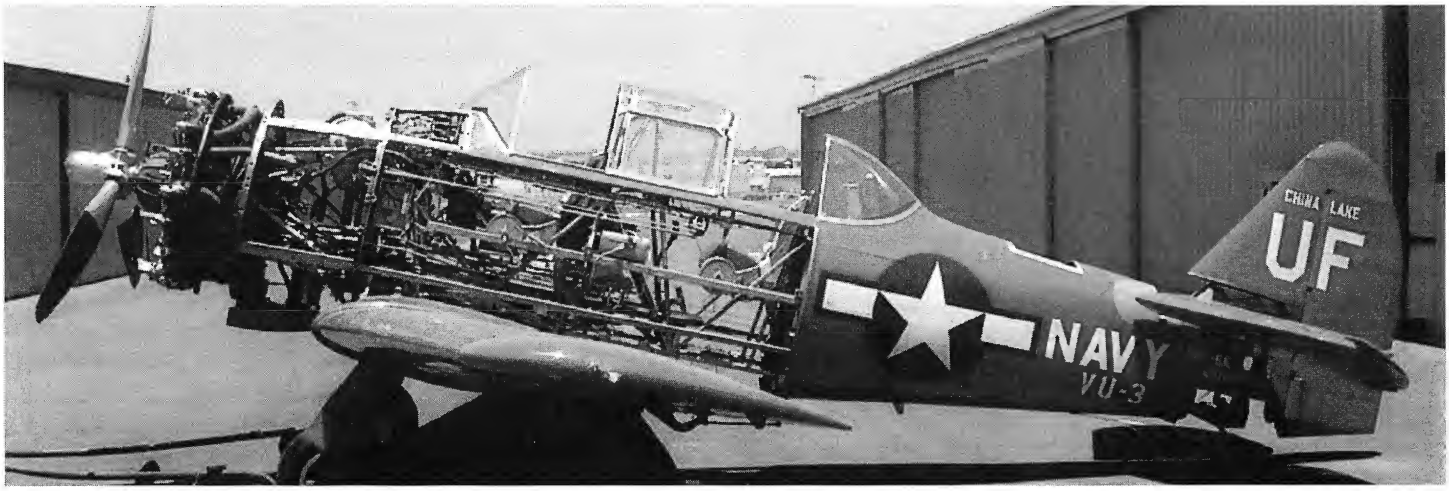


Photo from the Frank Compton Collection

The NAA T-6J, last of the standardized advanced trainers, shown in strip down condition for annual inspection. Cowling, doors and panels can be removed in approximately 40 minutes. The general configuration of this aircraft is very representative of the NA-16 lineage, starting with the BT-9 and ending with the T-6. This aircraft, N36FC, is currently owned and flown by the author and his son, Frank Jr.

ing accessory panels and swing open doors, it was possible to obtain convenient and unobstructed access to the internal structure, equipment and components for inspection, replacement and repairs. This feature was of utmost importance to both the U.S. Military operators and export purchasers concerned with keeping the maximum number of available trainers in flight line ready condition.

Also advantageous to the NA-16 baseline design was parts and components interchangeability, an important element in the overall designed-in maintainability concept. Through design of the airframe in logical, quickly detachable components, assembled in steel tooling, NAA achieved a new industry high in interchangeability. For example, the wing panels and tail planes could be quickly detached and replaced with spare units without long inactivation for repairs. The entire power plant installation was designed and built as an integral unit, which could be removed and replaced in a matter of hours instead of days.

From the very start, BT-9 production was on schedule and within cost. Operational readiness rates were high. In the eyes of the Army Air Corps, the BT-9 was a "banner program". Everything, however, was not "rosy". A serious problem developed with the use of the airplane as a training platform for beginning pilots. A string of fatal accidents prompted the Training Command to issue an unsatisfactory report, citing the unacceptable stall departure-spin recovery characteristics of the BT-9 basic trainer aircraft. Although the aircraft was not removed from service, the Material Command immediately initiated a flight test program at Wright Field to investigate these characteristics as reported in the Training Command U.R. On December 28, 1936, Lt. Col. O. P. Echols released the early test findings, which concluded "the spinning characteristics of the North American trainer were definitely unsafe as it would not recover due to lack of effective control." At this point, General Hap Arnold traveled to Inglewood to confront Dutch and Lee to demand a suitable fix.

Concerned that this crisis situation could lead to curtailment or possible cancellation of the BT-9 production program, Dutch responded by scheduling a series of flight tests to investigate and resolve this aerodynamic dilemma. Testing included the effectiveness of a fixed eyebrow slat installation on the leading edge of the wings to curtail premature tip stall. To improve spin recovery, the tail arm was eventually lengthened by inserting a 6" fuselage extension at Fuselage Station 236. Although the fixed slat installation provided substantially better stall characteristics and cleared the BT-9 for normal training operations, it was not a satisfactory permanent solution.

It is not my intent to overplay the BT-9 low speed handling problems. However, a quick and satisfactory solution to the problem was critical to the company's future. Harold Raynor, at the time Dutch's Staff Assistant, put it this way, "The Company was in its infancy, cash poor and struggling. Failure to have come up with acceptable solutions to the BT-9 airworthiness deficiencies could have drastically affected the Company's prominence and growth." For sure, the entire NA-16 lineage would have been in jeopardy.

Twisting the outer wing panel, providing a 2-degree washout, further improved the stall characteristics. Twisted wing panels were introduced at a change point on both the BT-9 production line and later on the BC-1 line. Twisted panels were also retrofitted on all earlier BT-9 and BC-1 aircraft at Kelly Field. Flight testing of the twisted wing configuration continued through 1937, concluding in a final series of tests flown by test pilot Alex Burton in a bailed Navy NJ-1 aircraft in November 1937.



Photo from the Frank Compton Collection

Army Air Corps instructor pilot discusses the stall-departure characteristics of the BT-9, pointing out the fixed eye brow slat modification to student pilots at Randolph Field – 1937.

The final change to the NA-16 series wing outer panels to improve stall departure-spin recovery characteristics came with the adoption of the cambered NACA 4412 airfoil section with a 2-degree twist. This new wing was initially installed on the one only BT-9D and all subsequent NA-16 models and variants to follow, starting with the BT-14.

The T-28

The T-28 developed into a superb training machine. It exhibits superior handling qualities with a docile stall. Wing roll-off during a fully developed stall is easily controlled with rudder pressure. Spin departure resistance is significantly improved over the time honored T-6/SNJ/Harvards, the all time most flown military trainer. The control harmony is as good as it gets for a high performance propeller driven aircraft. In spite of early-on problems with the R-1300-1A engine, the operational readiness rate remained at high levels.

In mid-June 1947, Howard Evans, LAD Chief Designer, received an advanced copy of the XTB trainer request for proposal (RFP) from the Army Air Material Command. Howard commented, "We need to do something different to win this one." He was, in fact, referring to the "plain vanilla" flavor of the specifications spelled out in the document. It became obvious that the industry responses would be "mirror images", one like the other. This encouraged us to look at other avenues, ones that might enhance our proposal position.

As Lead Preliminary Designer, assigned by Ed Schmued and Howard Evans to spearhead the XTB trainer preliminary design and proposal preparation, I formally initiated project activity and assembled the proposal team. In tempo with support organizations, study areas were identified and numerous ideas were reviewed.

During discussions with several of the "Old Hands", in particular Harold Raynor, the light came on! Why not, one more time, offer a high rate of readiness concept based on our BT-9 experience. Sorting everything out, it was further determined that the maintenance index must be comparable to the T-6 Texan. Considering the increased complexity projected for the XTB configuration, this would be a difficult act to follow.

In late 1947, a designed built-in maintenance concept featuring quick access and component interchangeability was presented to Howard Evans and Ray Rice, LAD Chief Engineer.

NAA Trainers – Winning The Competitions!

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NAA Trainers – Winning The Competitions!
(continued from page 7)

Study results of the structural-vs.-quick access compromises and associated weight/performance/cost tradeoffs were reviewed, showing a 2-1/2% increase in gross weight with correlative cost growth. Ray mentioned that might be shooting ourselves in the foot if the Wright Field evaluators do not concur with the long-term advantages offered by our proposal. However, without hesitation, Ray gave us the nod to proceed with the NA-159 design activity.

The NA-159 (XT-28) proposal team principals included Hugh Elkin, Power Plant Designer; George Douglas, Wing and Fuselage Structural Designer, Al Arslan, Stress Analyst; and others. Engineering support people included Vic Johnson for Weights and the Aero Team with Jack Bonner, Morgan "Mac" Blair and Roy Jackson.

Planning on a "win", Dave Hoffman was brought into the picture as "Production Project Engineer in waiting" and was given the responsibility to prepare the detail (model) specification in support of contract and pricing work. Fred Schmidt, the Mystery Man, would appear from time to time, meandering through the design room asking a few questions, while referring to his little black book. Fred was working up the closely held cost and pricing numbers. On April 5, 1948, six months after the establishment of an independent United States Air Force, NAA received a letter of intent from the USAF to proceed with construction of two test and one static articles. First flight of the XT-28 occurred on September 24, 1949 with Skip Zeigler at the controls.

As it turned out, emphasis on superior maintainability was the overriding factor, swinging the competitive advantage to the NAA entry. This was confirmed by key USAF principals following the post award critique at Wright Field.

In brief, the maintainability features designed into the T-28 include: quick opening bi-fold doors behind and under the rear cockpit which provide unrestricted ground level access to instrument subsystems, electrical and hydraulic system components, radio/navigation equipment including wire harness and power supply units, control cables, oxygen system equipment and miscellaneous subsystem components. Up front, through the nose wheel retract well, access is available to the engine accessory compartment through a quick opening door in the firewall. Access to the forward engine section is provided by opening large clamshell cowling sections on the upper right and left side and the lower right side of the cowling unit.



Photo Courtesy of Boeing Historical Archives

The North American Aviation T-28B shown in inspection ready condition. Maintainability features include quick opening cowling segments and a large non-structural access door under the rear cockpit floor area.

Facing aft, in the nose wheel well, access to the center fuselage area below the wing carry-through structure is readily available for inspection and repair of flight controls, electrical wire bundles, ordnance controls and subsystem components.

The "black boxes" are arranged so that any one box can be removed without affecting the installation of the others. No work stands are required for normal maintenance, with the exception of a small ladder to reach the topside of the engine.

The T-2

In November 1950, the Columbus Plant, a Navy industrial reserve facility formerly operated by the Curtiss-Wright Corporation, was formally assigned to North American Aviation and became the production site for NAA's Naval Aircraft Programs and a second source for USAF Programs in production at LAD, i.e. the F-86F, F-86H and the F-100.

My career path had led me to the Columbus facility in early 1953, where I was charged with organizing and managing an advanced design group, reporting to George Gehrkens, Division Chief Engineer. George, a very perceptive and capable person, was well thought of in Navy circles. His presence gave credence to our competitive stance.

Preceding me to Columbus was Morgan "Mac" Blair who had assembled a "top notch" advanced aerodynamics unit. In consort, our design and aero team maintained close contact with pertinent Navy elements and selectively responded to Navy let RFP's.

In early 1956, a Navy Bureau of Aeronautics request for proposal was received which spelled out the requirements for a multi-role, carrier operable, jet trainer of "fundamental design", which would provide an efficient tractable interface with primary/basic propeller driven aircraft and possess the characteristics necessary for carrier qualification, instrument, weapon delivery and gunnery training. Further, life cycle costs and maintainability objectives would receive weighty consideration. Deja vu! Here we go again! Should we again propose a superior maintainability approach to enhance our competitive posture? The answer was a resounding "Yes!"

In the shadow of the company's T-28 experience, we presented a plan tailored to fit the Navy's need, with emphasis on achieving optimum access with minimal weight increase for all maintenance functions. This was realized through a coordinated design for "deck level" access, particularly important to hangar deck maintenance actions. Sizeable access doors and panels were provided with quick opening fasteners and latches. Behind the access doors, one deep location for the majority of the equipment and subsystem components was presented. Total engine access, compressor to hot section, was also provided behind the quick opening doors.

The fuselage mid wing design with the lower longerons positioned below the carry-through wing box presented the best structural arrangement. The engine compartment, equipment components and associated substructure was essentially hung from the overhead load carrying fuselage structure and enclosed with large, quick opening doors.

The Bureau of Aeronautics evaluation of the five major en-

NAA Trainers – Winning The Competitions!
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Restoring The First F-107A

by William J. Simone

North American Aviation's oft forgotten F-107A remains one of the most enigmatic of the famous early "Century Series" fighters. The enigma stems from the fact that it was an outstanding and extraordinarily effective warplane and was, perhaps, the best airplane in the world for its particular mission at the time of its first flight in late 1956. It was never to go into production, even in light of its superior capabilities. The F-107A, however, did score several "firsts". Among them was a truly unique flight control system, an advanced inlet system and the incorporation of a semi submerged store. It was also the last of a long line of North American Aviation fighters to be built.

Three F-107A fighter-bombers were produced by NAA in the mid-1950's. The first F-107A, Air Force Serial No. 55-5118, was used for stability, control and performance testing, along with all of the ground testing required for flight clearance. The aircraft was equipped with a two position VAID. The VAID, "Variable Inlet Duct", was developed to provide maximum net propulsive effort as well as stable duct operations over the supersonic flight regime of the airplane's performance envelope.

At retirement, the first F-107A had completed 93 flights for an accumulated total flight time of 61 hours and 35 minutes. My love affair with the F-107A began in 1958 when my father took me to the NAA Flight Test Center located at USAF Plant 42 in Palmdale, CA. Out on the ramp sat this very unique aircraft, unlike any I have ever seen before. It was the first F-107A.

Unlike most experimental airplanes, which are normally scrapped soon after testing is complete, two of the three F-107A's survived to become static display aircraft while parts of the third would fly on other test beds, advancing the technology. This is the story of the first F-107A.

In the early 1960's, the first and third F-107As were shipped from Edwards AFB to Norton AFB, California where they were made available as props for movies (it was the custom at the time for the Air Force to keep aircraft available for nearby Hollywood). At Norton, they joined a collection of similarly assigned airplanes that included a B-29A, RB-45C, XF-85, B-47B, several F-86s, XT-37A, VB-17G and a B-50A "Lucky Lady II". In 1965, when the base changed commands, most of these airplanes were either scrapped or given away.

The first F-107A, along with several other aircraft, ended up in the possession of Frank Tallman and Paul Mantz and was put on display at their Tallmantz Movieland of the Air Museum, located at the Orange County Airport in Santa Ana, California. Unfortunately, it was left to deteriorate and nothing was done to protect it from the inclement weather or vandalism.

In 1967, I spotted the airplane in Tallman's yard. This led to an interesting discovery. It was originally thought to be Aircraft 55-5120 as identified on its vertical fin, but, actually, it was Aircraft 55-5118 as identified on its data plate. Further verification of this occurred shortly afterwards when it was discovered that 55118 was discernable underneath the 55120 painted on the vertical fin.

By 1972, Tallmantz Aviation decided to dispose of its aircraft collection and to concentrate on the flight school and aircraft maintenance business. According, many of the aircraft were sold, given away or, unfortunately, scrapped. Tallmantz Aviation no longer had any interest in keeping the F-107A. That summer, Mal Gougon and I disassembled 55-5118 and saved it from the torch.

Disassembly of the airplane was a challenging task for at the time, there were no tech orders available. NAA had given away their only set ten years earlier. As luck would have it, I located and obtained a near complete marked up review copy few months after we had disassembled and moved the airplane. I am still in search of a complete set!

The first difficulty encountered during the disassembly was the removal of the vertical stabilizer. We had no sling. From the limited data available, it appeared that it weighed about 300 lbs., so a sling was constructed to handle the weight. With the sling in place, the crane started to pull but the vertical tail did not come off! In fact, the entire aircraft started to come off the ground! After a closer inspection, it was determined that all the bolts were indeed removed: the problem being many years of rust. On the second try, the vertical fin came off with a bang and broke loose from the sling. The separation of the tail from the fuselage resulted in the release of several gallons of very rusty water, but with no apparent damage to either the vertical stabilizer or the spindle.

The only other major problem was the removal of the wings from the fuselage. Tallmantz personnel reassembled the aircraft after it was moved from Norton AFB. However, they had replaced the special wing attachment bolts with pins. These pins were inserted with a sledge hammer! The removal of these pins took almost six months and gallons of WD-40 and Liquid Wrench. They were frozen solid with rust. Once the wings were removed, the rest of the disassembly went quickly.

The Air Force Museum now became aware of our F-107A salvaging effort and expressed the opinion that the airplane was still under their jurisdiction. The other aircraft obtained from the Norton AFB collection—an XT-37, a B-29A, a VB-17G, two F-86As, a B-50A fuselage and an X-7—were never claimed to be under their jurisdiction. Many remain in private hands. The USAF never indicated any interest in the preservation of the F-107A and had ordered that it be scrapped in November 1972 because of mounting tie-down fees at the airport.

Things really picked up after November, but heavy rains that winter delayed the removal of the now disassembled airframe from the airport. Rockwell International agreed to supply a crane and truck, as well as storage space at RI/LAD. The U.S. Army also provided a truck. The F-107A was once again going home!

Once at the Rockwell plant, corrosion control was started. A fresh coat of paint was applied to protect the aircraft from further corrosion, and hopefully to attract attention with the intent of recruiting more volunteers. We got one extremely

Restoring The First F-107A

(continued on page 10)



Photo from the William J. Simone Collection

The Number One F-107A, S/N 55-5118, in the Pima Air and Space Museum Restoration Hangar

Restoring The First F-107A

(continued from page 7)

helpful volunteer! Gene Boswell, B-1 Division Public Relations, supplied a vast amount of knowledge and information. I can honestly say that without his help the project would have made little headway.

In November 1973, the Air Force Museum ordered the aircraft from the Rockwell facility and returned to Norton AFB. I was notified of this only a day before the USAF Orientation Group, Det. 1, was scheduled to remove the aircraft. The Orientation Group had been informed that the aircraft was crated and that a small truck-mounted crane and a 50-foot truck could handle the load in one trip. The Orientation Group had no idea on how to move the F-107A and decided it would be best to cut the wing box off the outer panel and load the forward fuselage on its side to reduce the height of the load. This approach, of course, would have destroyed the aircraft. With the help of my father, Joseph D. Simone, and many others: I arranged through Mr. Donatoni of Rockwell Transportation, the loan of a special lowboy trailer to transport the wings and fuselage and a huge forklift to lift them.

The aircraft was moved from the Rockwell facility to Norton AFB on November 27, 1973 where it remained until June 1974 when it was transported to the Pima County Air Museum (later renamed the Pima Air and Space Museum) located in Tucson, AZ.

There the aircraft sat disassembled but intact. Unfortunately, during this time, the airplane picked up a great deal of "skin rash". In 1976, it was reassembled and put on display unrestored. Unfortunately, the well meaning museum volunteers failed to follow the instructions which I had supplied the museum years earlier, lifted the fuselage only at the forward hoist point and managed to bend the structure and crack the canopy. Thankfully, these well-meaning volunteers are no longer with the museum, having been replaced by a very dedicated and professional crew.

By June 1980, it received a coat of much needed zinc chromate and in February 1983, a beautiful but inaccurate paint job, thus allowing it to take its place among the proud Century Series of fighters on display at the museum.

In March 2001, 55-5118 was moved into the excellent Pima restoration facility for a full static restoration. The aircraft was thoroughly cleaned and corrosion control applied to the airframe. Much of the "skin rash", landing gear and wheel wells were repaired, and the VAID probes and pitot booms replaced. A J75 engine A/B section now fills the once empty engine bay. The Michelin Tire Company donated a set of new tires. The aircraft received a new coat of paint and was fully detailed with the many hundreds of markings that it carried during its flight test program. I paid for the restoration.

On April 5, 2002, after nearly a year of restoration effort, the aircraft was rolled out! Al White, who made the first flight of the Number Three aircraft and did weapon separation tests on the Number Two aircraft and I attended the event. Unfortunately, J.O. Roberts, who made the first flight of the Number Two aircraft and flew the F-107A more than anyone else and Robert Baker, the first pilot to fly this airplane, were unable to attend.

On April 27-28, 2002, the F-107A was displayed at the Davis-Monthan AFB Air Show and drew a huge crowd. Al White and I were present to answer questions. Not surprising, most people did not know of the airplane and were very impressed when they learned that it was designed nearly 50 years ago.

Much work still needs to be done. The cockpit, once 95% complete, has been stripped of many of its flight test instruments by the Air Force Museum because of radium concern. Many of the instrument light "eye brows" are now missing and must be replaced. During the summer, the cockpit temperature exceeds 130 degrees. This has caused damage to the landing gear handle, ejection seat headrest, armrests and other plastic parts. They will have to be replaced. In addition, "skin rash" still needs to be repaired, especially on the right wing slats. This will be done the next time the aircraft is repainted.

Unfortunately, the aircraft will be displayed outdoors until a hangar can be built. No cockpit restoration will be done until the aircraft is displayed inside. One major item taken from the cockpit while the aircraft was still at Tallmantz Movieland of the Air was the unique control stick grip. It will cost at least $1000.00 to manufacture a replacement non-functional stick grip. If anyone knows where the original stick grip is, please contact me at (661) 948-8580. No questions asked!

The Pima Air and Space Museum is a private non-profit, educational organization. It is funded solely by gate receipts, gift shop sales, membership and donations. The museum receives no funds from governmental agencies.

The museum master calls for a hangar to house the F-80B, F-84F, F-86L, F-86H, F-89J, F-94C, F-100C, F-101B, RF-101C, F-102A, TF-102A, F-104D, F-105D, F-105G, F-106A and the F-107A to be erected in the future. The hangar will cost about one million

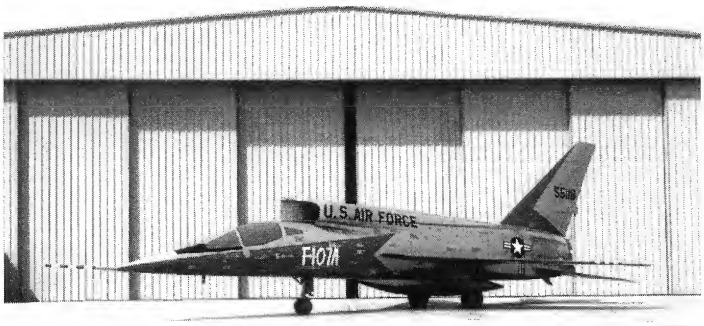


Photo from the William J. Simone Collection
Number One F-107A, S/N 55-5118, during post-restoration rollout at Pima, April 5, 2002



Photo from the NAARB Archives
Number One F-107A, S/N 55-5118, airborne in flight test during the 1950's

dollars. Anyone interested in helping is encouraged to contact Sandy Moomey, Deputy Director of Development and Community Relations, Pima Air and Space Museum. She may be reached at (520) 618-4804. You must specify that your contribution go to the hangar fund or it will go into the general fund and be used as the museum sees fit.

About the Author: Although born in New York, Bill was raised in California. He is the son of Joseph Simone who worked at NAA for nearly 25 years, LAD Department 64, Facilities, including nine months at Autonetics and four years at USAF Plant 42. After receiving his degree in Aerospace Engineering, Bill was commissioned a 2nd Lieutenant in the USAF where he flew the T-34. He also worked on the B-1A, Space Shuttle, F-5E/F, RF-5E, F-20, JPATS and other programs. He has an extensive background in flight test and is currently an engineer at the Lockheed Martin Skunk Works. He has written several articles on the F-107A and his upcoming book, parts of which appeared in this article, on the F-107A is scheduled for publication this winter. Bill may be contacted at (661) 948-8580 or e-mail at william.simone@lmco.com. He would like to hear from anyone who shares his interest in the F-107A. He resides in Lancaster, CA.



Photo from the William J. Simone Collection
Author in cockpit of unrestored F-107A, S/N 55-5118, August 2000

NAA Trainers – Winning The Competitions!
(continued from page 8)

trants: Lockheed, Grumman, Fairchild, Vought and NAA was completed in late 1956 and the award was given to NAA to construct six Y2J-1 (NA-241) aircraft. Without question, Navy experience with the SNJ and the T-28B/C trainers influenced the selection of the NAA proposal. Not withstanding, however, post award interviews with the Bureau of Aeronautics Evaluation Board made it quite clear that NAA's design approach to maintainability and interchangeability weighed heavily in the selection process.

The first flight of the Y2J-1 aircraft took place at the Columbus plant on December 27, 1957, flown by engineering test pilot Richard Wenzell.

For perspective, the early model T2J-1 was a single engine configuration using a Westinghouse J-34-WE-48 turbo jet. Follow-on production (NA-405) T-2B's and C's were equipped with Pratt and Whitney J-60-P-6's and, later, the General Electric J-85-GE-4 power plants. Changeover to the twin engine configuration became necessary to improve climb and ceiling performance to satisfy changes to the Navy's flight training profiles.

Today, it is inconceivable that North American Aviation, a company which produced more than 60,000 of the world's all time "greatest aircraft" is no longer in competitive contention!



Photo from the Frank Compton Collection
The North American Aviation T2J-1 on display at Andrews Air Force Base, Summer 1960, with left and right quick opening, non structural service doors hinged below the wing and forward at cockpit floor level. This arrangement provides deck level access to engine bay and equipment compartment.



About the Author: Frank Compton learned how to fly in the Air National Guard which employed the NAA O-47. His experience with that aircraft led him to seek employment in September 1940 with NAA as a draftsman. A series of assignments heralded a position in the Preliminary Design Group. In 1944, he left NAA to serve with the Navy as a flight engineer aboard PBM-5 long-range patrol seaplanes. After the war, Frank returned to LAD and worked in Preliminary Design on several aircraft. He was, subsequently, transferred to the Columbus Division as Chief Preliminary Designer and, later, Manager of Advanced Systems. During the next four years, his organization captured three major Navy programs: the A3J-1/RA-5 attack bomber, the T2J jet trainer and the FJ-4 carrier based fighter. In 1960, he returned to California as VP of Advanced Program Development at Space and Information Systems and in 1966, went to Autonetics as Vice President of Ocean Systems Operations. He left NAA in 1970 and was associated with various aerospace organizations until he retired in 1988. Frank resides in Torrance, CA.

The Silent Majority

by Stan Guzy



KUSTRA, ALFRED F., 86 - died peacefully on July 17, 2002 in an intensive care unit as the result of a massive heart attack. Al's career with NAA began in Kansas during WWII and the heyday of the B-25. He was on the original team that established the Los Angeles Division (LAD) and served as the Group Leader of the Chief Engineer's Office under Ray Rice and Red Hansen. Al had become well known at LAD as well as the Corporate Offices and several other divisions. He was very active in the Bald Eagles Club and served on its Board of Directors from the time it became incorporated. He was also instrumental in organizing the LAD Retiree Club when he retired in 1981 and became the Editor of the Retiree News after the retirement of the Bill Barker, the founding editor. Al was a devoted family man, a consummate do-it-your-selfer, an avid scouter, and an active member of the San Pedro Elks. He was very proud of his career with NAA and will be missed by his many friends.

ADAMS JR., ARTHUR M., 86 - passed away on June 23, 2002 of unspecified causes in West Valley City, UT. He joined NAA/RI as a design engineer and worked on the Apollo Space program. Upon retirement from RI he returned to architectural design activities.

BELCHER II, HARMON N., 75 - long time South Bay resident died on June 13, 2002 of undisclosed causes. After migrating from the East Coast he went to work for NAA and became a chief source inspector. He had worked on various projects including the Sabre Jet, Super Sabre, Sabreliner, and the Apollo program. He was very dedicated to the Democratic Party of California and served it in many posts.

COFFMAN, VIRGIL C., 71 - died May 30, 2002 of cancer in Costa Mesa, CA. He was a retired aerospace engineer for RI Electronics.

CONE, TYRONE, - died on July 5, 2002 in Anaheim, CA as a result of lung cancer. He went to work at NAA in October 1962 and retired from Autonetics in August, 1999. He worked as an expert systems programmer for the Minuteman G&C subsystems.

CORNWELL, RALPH L., 88 - died May 20, 2002 in Salem, OR at the Salem Hospital ICU of undisclosed causes. He worked for NAA/Rockwell for 33 years before retiring in 1973. He took great pride in working in the aerospace industry building airframes. He is survived by his wife of 39 years, Venetta.

DECKER, CLEON N., 83 - died of a heart attack on March 29, 2002. He lived in Buena Park, CA and was a former assembler for NAA/Boeing.

DOLAN, GRANT T., 62 - died July 2, 2002 of a hemorrhage. He was a Staff Analyst for NAA/Boeing and is survived by his wife, Mary.

DORTCH, HARRY C., 82 - died of cancer on June 17, 2002. He lived in Seal Beach, CA and had worked at Autonetics in PP&C, and as an accounts analyst and a loaned executive for United Way. He is survived by his wife, Darlene.

FARRAND, WILLIAM, 79 - died October 19, 2001 at Pleasanton, CA from complications due to cancer. He had been an engineer for NAA/RI and a teacher at Cal State University Fullerton. He is survived by his wife, Eleanor.



MOORE, JOHN M., CDR, USN, 79 - died peacefully in his sleep on June 24, 2002 at his home in Cocoa Beach, FL after a long siege with cancer. John became a Naval aviator during WWII, transitioned to jets and served two tours in Korea as a fighter pilot. During his first tour, he sustained severe burns of face and hands aboard the carrier, USS Essex, when a crippled Banshee missed the tailhook cable, skipped over the protective barrier and crashed with a horrendous explosion into a plane he had just moved. The plane and John went over the side with him coming up in a circle of burning fuel. Seven crewmen were lost as a result of this accident. John continued flying as a Navy test pilot. His military honors include the Purple Heart and the Distinguished Flying Cross. He was a Fellow in the Society of Experimental Test Pilots and a Golden Eagle. Subsequently, he joined NAA, Columbus Division as a test pilot and became Manager of Flight Operations, accumulating thousands of hours in over 100 different types of experimental aircraft. Later, he became manager of Apollo Test and Operations at KSC. Upon retirement, he wrote his autobiography, *"The Wrong Stuff - Flying On The Edge of Disaster"* and became mayor of Cocoa Beach. In passing, he joins his beloved wife, Marilynn. He is mourned by four splendid children. Burial was at Arlington National Cemetery with full military honors.

FEDERSPIEL, DONALD E. R., 75 - died peacefully of natural causes on June 13, 2002 in Lawndale, CA. He had 45 years of service when he retired in March, 1991. Don worked as an LAD master model fabricator in the Tooling Department and was noted for his dedication to his craft.

FEHRMANN, JOHN E., 90 - died on May 31, 2002 in Vancouver, WA. He was an electronics engineer for Rockwell International for 15 years. Sent in by Gene Somers.

FLEETWOOD, JOHN W., 83 - died June 16, 2002 at TriCities Hospital in Vista, CA as a result of a massive stroke. He was employed at NAA/Rockwell for 28 years and had held a number of senior manufacturing management positions, including Director of Manufacturing for both the Apollo and Saturn II programs. He is survived by his wife, Mary.

FLUCK, JOHN G., 83 - died of coronary artery disease on July 25, 2002 in Fullerton, CA. He had worked as an engineer/manufacturing manager for North American Rockwell. He is survived by his wife, Frida.

FRANKS, CLYDE, 74 - died June 9, 2002, cause of death unspecified. He had worked in QA and Policies & Procedures at NAA and was a member of the Flying Club.

GOLL, ROBERT C., 84 - died May 15, 2002 of natural causes in Fullerton, CA. He was employed as an Industrial Engineer at Autonetics and had been retired for many years. Sent in by Maxine Haun.

GRIGONIS, JOHN J., 87 - died July 6, 2002 of unspecified causes at Three Rivers Community Hospital in Grants Pass, OR. Prior to his retirement in 1975, he worked as an engineer for RI. He is survived by his wife, Dorothea.

HARDER, SHIRLEY L., 83 - died in Las Vegas, NV of natural causes (date unavailable). Shirley worked in Blueprints and Photographic at the Downey Facility. Information provided by her loving husband, Rusty.

HART, WILLLIAM "BILL" H., 77 - died April 13, 2001 of Alzheimer's disease. Formerly of Yorba Linda, CA he had been a systems analyst for RI before retirement.

HILL, LILLIAN D., 84 - died of cancer on May 3, 2002 in Redondo Beach, CA. During WWII she joined the engineering department of North American Aviation in Kansas City and moved to California to continue her work with the company. After marrying a young NAA engineer, she opted to return to the teaching profession. She served in the Lawndale School District for 30 years and was named "Teacher of the Year" in 1974. Sent in by Al Kustra.

JONES, SYLVESTER "RED" E., 74 - passed away on May 23, 2002 in Klamath Falls, OR. Red started in NAA/LAD in the 1950 time period and retired in 1983 from the Proposals and Estimating Group. He is survived by his wife of 49 years, Donna.

JORDAN, JOSEPHINE B., 85 - died of natural causes on June 15, 2002 in Fullerton, CA. She was a retired executive secretary for Rockwell International.

KALAJIAN, HARVEY "CAL" J., 86 - died in Santa Monica, CA on July 14, 2002 of heart failure. Harvey was a supervisor in Tool Engineering at LAD. Reported by his friend, Joe Moore.

KIEF, PHILLIP H., 75 - died July 3, 2002 of arrhythmia and cardiomyopathy in Boulder, CO. He was a retired aerospace engineer for RI.

KOZIEL, JOHN - passed away on January 4, 2002, cause unspecified. After a somewhat dangerous and adventurous period in Poland during WWII, John returned to the United States in 1948 and went to work for Rockwell International. He worked for RI for 29 years as an electronic technician. While employed at Rockwell, he learned to fly and got his private pilot's license. He is survived by his wife, Lottie.

LINDSEY, JAMES H., 81 - passed away on June 21, 2002 from complications following a stroke in Rancho Bernardo, CA. As a professional model builder he produced museum-quality display models for NAA for more than 30 years, mostly at LAD. He retired in 1981 and is survived by his wife, Pauline. Information sent in by George Stayboldt.

LUEKE, JOSEPH C., 60 - passed away on June 23, 2002 in Downey, CA after an extended bout with prostate cancer. He had a 45 year career in aerospace engineering with NAA, RI and Boeing. He had been challenged and fulfilled by his work on the Navaho, Apollo, NASP, XB-70, B-1 Lancer and Skylab programs. Conrad is survived by his loving wife of 46 years, Joan. Sent in by Bruce Fow.

MARBLE, CLARENCE "BUD", 79 - died on May 21, 2002 in Long Beach, CA. He served in the USAF as a B-29 pilot, graduated with a BSME degree from U.C. Berkeley and was then hired by NAA in 1952. He began his career in Power Plant design, moved to the Power Plant Test Group and completed his career there. He retired in January 1983. Submitted by Bill Birdsall.

MARSH, STEPHEN J., 84 - died May 20, 2002 of natural causes. He lived in Santa Ana, CA and had retired from Rockwell where he worked as a data management analyst. He is survived by his wife, Elizabeth.

MARTINEZ, ISAAC "IKE" C., 79 - died May 21, 2002 of unspecified causes. He lived in Stanton, CA and was employed by RI at the Autonetics facility. He retired from RI in 1990. He is survived by his wife, Mary.

MEIHOFFER JR., JULIUS "MIKE" J., 84 - passed away on February 9, 2002 after a long bout with liver problems. His last assignment was as a mill machine operator in the Tooling Department of LAD. He had retired in 1989 after 29 years of service.

METZ, MILDRED G., 81 - died June 26, 2002 of heart disease. She lived in Placentia, CA. She had been an accountant for North American Rockwell.

MOORE, MURRAY F., 76 - died March 5, 2002 of unspecified causes. He was a WWII Navy pilot, an Iwo Jima survivor and employed by NAA in 1951. He had worked on the Navaho, Hound Dog, Saturn, Skylab, and the Space Shuttle programs before he retired in 1989. He is survived by his wife Linda.

MOORE SR., WARDELL B., 72 - died on April 29, 2002 in Los Angeles, CA. He joined NAA at LAD, working in the Bomb/Navigation Group of Engineering. He transferred to Space Div./Downey and served in the Apollo Reliability Group. He rejoined LAD in 1972 and served as supervisor in the Avionics section. He is survived by his wife Bobra. Sent in by Charlie Chin.

MUCK, DAVID, 74 - died July 24, 2002 at St. Jude Hospital in Fullerton, CA of causes yet to be determined. He hired into NAA in 1960 and served primarily as a pricing manager until his retirement in 1989 after 29 years of service.

MUELLER, JOHN C., 86 - died June 10, 2002 at Santa Monica Hospital of unspecified causes. He went to work for NAA in 1941 and retired from the Corporate Offices in 1978. He was an active outdoorsman. Sent in by George Wylie.

NAVENS, WILLIAM, 71 - died on June 4, 2002 at his home in Canyon Lake, CA from unspecified causes. Bill had served as a project manager for NAA/RI and Boeing during his 31 year career. He is survived by his wife of 52 years, Lois Jean.

NICHOLLS II, AUGUSTUS H., 83 - died May 20, 2002 of unspecified causes. He had joined RI as a material and processes engineer playing a major part in the design and fabrication of the first Apollo space capsule. He retired in 1974 and later moved to Richmond, VA.

PAINE, STEPHEN T., 77 - died May 21, 2002 of heart disease. He had been a computer analyst for RI.

PEEBLES, DON MACK, 69 - died July 16, 2002 in Cottonwood, AZ of causes yet to be determined. He had retired from RI and was survived by his wife, Naldi.

PETERSEN, FRANK, - died November 11, 2001 of a heart attack. Information provided by his wife of 60 years, Dorothy. No additional data provided.

PLUNKETT JR., RAY E., 84 - passed away on May 21, 2002 at Little Company of Mary Hospital in Torrance, CA of complications following open-heart surgery. Ray dedicated his entire working career to NAA/RI from 1939 until his retirement in 1978, serving at the manufacturing facilities in Inglewood and Palmdale, CA, Columbus, OH and later at Edwards AFB. He specialized in engine control design and contributed to the development of the B-25 Mitchell, P-51 Mustang, P-82 Twin Mustang, F-86 Sabre Jet, FJ-1 Fury, F-100 Super Sabre, T-39 Sabreliner, XB-70 Valkyrie and the B-1 Lancer. He was a long time member of the management club and the Bald Eagles. Sent in by a grateful coworker and friend, P. Bruce Fow.

PURDUM, DUANE, 82 - died on July 21, 2002 in Garden Grove, CA of natural causes. He had been a rocket technician for RI before retirement. He is survived by his wife, Ida.

ROACH, DONNA L., 45 - died June 25, 2002 of causes yet to be determined. She had been an accountant for NAA/Boeing.

RUEFF JR., THEODORE, 78 - died June 22, 2002 of cancer at his home in Hesperia, CA. He worked as an electronics engineer for RI until his retirement after 22 years of service.

SEILER, MARIE A., 81 - died June 13, 2002 of kidney failure at her daughter's home in Nuevo, CA. She had worked at NAA/RI for 10 years.

SHEARER, MIKE, 63 - died April 27, 2002 of lung cancer in Mission Viejo, CA. He had been an engineer for NAA/RI. He is survived by his wife, Lily.

SHEPPARD, MARY R. (REED), 80 - died on June 2, 2002 of unspecified causes. She had retired from NAA/RI Space Division where she excelled as a highly accredited wiring technician on the Apollo Program.

SHERIDAN, JOHN G., 86 - passed away on February 26, 2002 from a cerebral hemorrhage at his home in Rogue River, OR. He had retired in 1971 after 33 years of service, primarily in manufacturing management and supervision. His work was always of the highest quality and after retirement was credited with designing surgical instruments for a local surgeon. John was also a long time member of the Grants Pass Picnic Committee. He is survived by his loving wife, Mary.

SPEHAR, FRANCES E., 93 - died June 27, 2002 of natural causes. She lived in Anaheim, CA and was an accountant for RI when she retired.

SPOFFORD, JOAN K., 82 - died June 1, 2002 of natural causes. She had lived in Orange, CA and worked in production control for RI.

STREMEL, ALEXANDER P., 86 - died May 6, 2002 at Mercy Medical Center in Mount Shasta, CA of unspecified causes. He had been the garage supervisor for LAD/RI for many years. Information sent in by Pat Cunningham and Dick Slepicka.

STUMPF, ROBERT E., 87 - died April 28, 2002 of heart disease in Buena Park, CA. He worked as a machinist for RI. Sent in by Maxine Haun.

THOMSON, JOHN S., 88 - died July 28, 2002 of causes yet to be determined. He lived in Mission Viejo, CA and was a tooling inspector for NAA/RI. He is survived by his wife, Florence.

WALLACK, PAUL M., 74 - died March 10, 2001 of undisclosed causes. After receiving his Ph.D from Oklahoma State University he went to work for RI on the Apollo and Minuteman programs and in the development of the GPS system. Paul retired in 1988 and is survived by his wife Rosemarie.

WALTER, JACK, 91 - of Fullerton, CA died July 14, 2002 of causes yet to be determined. He was a retired optics engineer for NAA/RI. He is survived by his wife, Margarita.

WALTERS, MAURICE "DON", 91 - of Mission Viejo, CA died on February 20, 2002 of natural causes. Don retired from Autonetics in 1984 after 44 years of service. In 1941, he was the Chief Test Pilot at the NAA facility in Kansas City, MO. He leaves a loving wife, Trudy.

WEISSENBERGER, GREGORY A., 65 - died October 21, 2001 of heart disease in Mission Viejo, CA. He had been a computer system analyst for RI.

WETTLESON, JAMES J., 64 - passed away at his home in Thousand Oaks, CA from unspecified causes. He enjoyed an illustrious career at several NAA/RI divisions primarily in the field of Human Resources management. After 31 years he retired from the Science Center as the Director of Human Resources and Communications. Jim is survived by his wife, Sylvia.

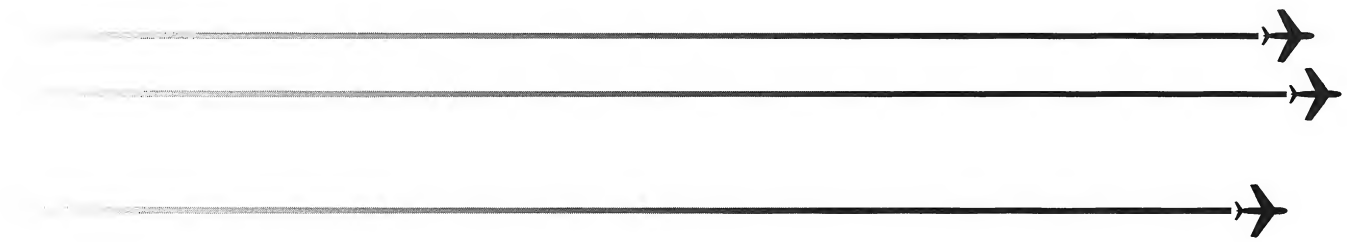
WINGFIELD, DONALD E., 65 - died July 24, 2002 of lung cancer at his Sun City, CA home. He had worked in various managerial positions at RI for 33 years before retiring in 1994. He is survived by his wife Lorece.

YOUNG, ARLENE M., 85 - died March 27, 2002 at Menifee Valley Medical Center in Sun City, CA of unspecified causes. She had been an administrative assistant at NAA Autonetics for 10 years.

ZEDEKAR, STANLEY "STAN", - died on May 30, 2002 in Port Angeles, WA. Actual cause of death was uncertain but it was reported that he had been fighting cancer. Stan joined the Autonetics Inertial Instrument Group in 1961 and retired in 1979. He is survived by his wife, Charlotte.

Editorial Comment: As noted in the Spring Issue, certain basic biographical information is required for inclusion in the Silent Majority obituary. Many newspaper notices are deficient in this respect. If you send in a notice please include all required information to preclude delays in publication. Additionally, overly lengthy biographies are by necessity edited for adaptation to the relatively small size of our publication. Thank you!

—S.W. Guzy, Editor, Silent Majority.



PAX DOMINI SIT SEMPER VOBISCUM

FIRST NAAR DIRECTORY COMING!

Have you lost track of your NAA/ Rockwell friend? After many requests, our Sonnie Robertson has developed a directory which will include all those that have given permission to be included and have ordered a copy. Publication of the NAAR Directory will be annually with the first issue planned for early 2003.

To be included in the directory, we must have the following form filled out and signed by you. No entries will be accepted by phone or fax. The completed form must be sent by December 31, 2002 with a check payable to BALD EAGLES INC. in the amount of $3.00 (to cover printing and postage costs). Please note on the check: For NAAR DIRECTORY. Directory is only available to NAA Retirees Bulletin Subscribers. Send to:

NAAR DIRECTORY
Retirees Bulletin Office
2600 Westminster Blvd.
P.O. Box 3644, M/C SJ51
Seal Beach, CA 90740-7644

REQUEST FORM

Yes! I would like to be included in the NAAR Directory and give my permission for the following information to be published.
NOTE: FILL IN ONLY THE INFORMATION YOU WISH TO HAVE PUBLISHED.

NAME _____

PHONE _____ CELL PHONE _____

ADDRESS _____

CITY _____ STATE _____ ZIP CODE _____

WEB SITE _____

RETIREMENT DATE _____ YEARS OF SERVICE _____

RETIRED FROM _____ DIVISION

SIGNATURE _____

If you want to keep your copy of the bulletin intact, make a copy of this form.

Contrails From The Past
(continued from page 4)

weeks that John referred to were fun. Gradually, after the merger it seemed to become just work. The North American Way to build the best systems for the United States and to provide a good livelihood for it's employees was transformed into show more profit for each quarter.

John talks about hiring generalists and I agree that every person he named added much to Autonetics' success. Although not mentioned, I think that Walt Evans should be on any list of key contributors. He could answer almost any technical question without resorting to pencil, paper or slide rule. I learned more from Walt, while eating our brown bag lunches, than from any engineering school.

Walt's Root Locus method of analyzing and synthesizing complex feedback control systems made servo system design a science rather than an art. It played a pivotal role in our ability to design and produce the systems John mentions.

I also feel that Bill Gress should be on this list! When our factory fell behind in producing inertial guidance systems, Bill was brought over from LAD and appointed factory manager. He established a "can do" attitude and got engineering to fully support the factory for whatever it took. Ross Schubert spent so much time in the factory, I had my secretary get his laundry done for him.

—Jeff Schmidt, King City, CA

Ed's Resp.: John Moore's two-part report is probably one of the most outstanding articles we will ever publish It certainly has caused a lot of comment, all favorable. He is a very busy individual but we shall try to induce him to favor us with more of his writings.

Dear Ed,

Many thanks to you and your staff for a great publication. I look forward to receiving each issue. The article by John R. Moore, "Legacies Left By NAA" was especially interesting and appreciated.

In the Summer Issue, the 62nd Wedding Anniversary of Mr. & Mrs. Affinito was noted. On September 28, 2002, my wife and I will celebrate our 50th Wedding Anniversary.

—Dick Hofstetter, Twin Peaks, CA

CONGRATULATIONS and MUCH HAPPINESS to

Ben and Rose Wright of Long Beach, CA on their 50th Wedding Anniversary

Dick and Judy Hofstetter of Twin Peaks, CA on their 50th Wedding Anniversary

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North American Aviation Retirees Bulletin

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Photo from the Jack Cavanaugh Collection

The X-10, No. 1, loaded on a trailer at Butler Hangar, located at the Long Beach Airport, just prior to being moved to Edwards Air Force Base at midnight.

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION
Retirees Bulletin

Winter 2002

Wishing you a Holiday Season filled with Peace and Joy

Inside: **A DOCENT AT THE SMITHSONIAN** by Tom Mackin
A LETTER FROM OUTER SPACE by Astronaut Peggy Whitson
BUILDING THE X-15, LEAPING AHEAD IN SPACE by Ed Rusinek

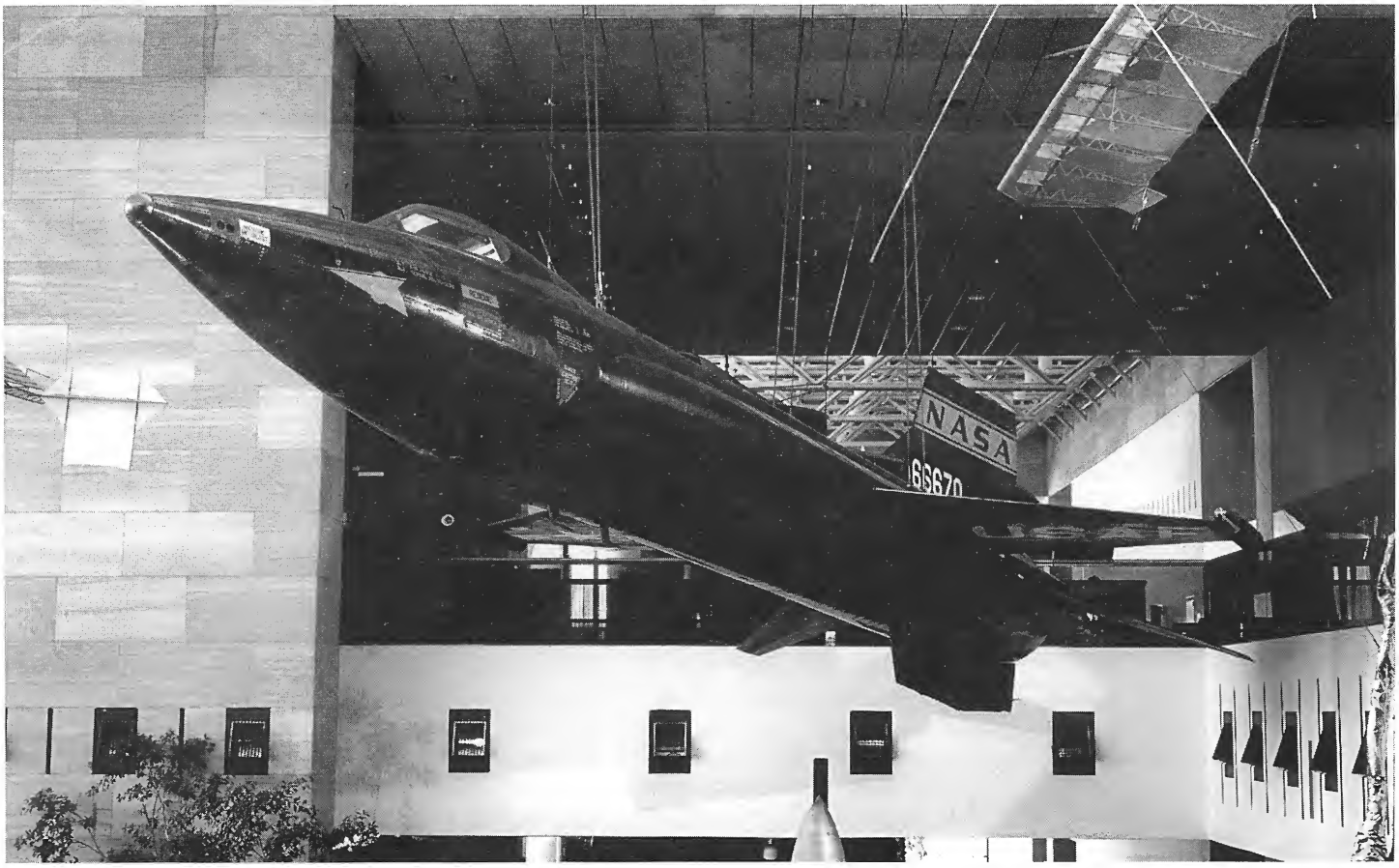


Photo from the Tom Mackin Collection

THE FIRST X-15, 56-6670, IS ON PERMANENT DISPLAY IN THE MAIN HALL OF THE SMITHSONIAN INSTITUTION'S NATIONAL AIR & SPACE MUSEUM ALONG WITH THE ORIGINAL WRIGHT 1903 *"FLYER"*, THE BELL X-1, THE *"SPIRIT OF ST. LOUIS"* AND THE APOLLO XI COMMAND MODULE.

NORTH AMERICAN AVIATION
Retirees Bulletin

NAAR BULLETIN, an affiliate of the **Bald Eagles, Inc.**, is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

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DEAR NAA RETIREES BULLETIN SUBSCRIBER

With this issue, the new editorial staff has completed its first year of service. I cannot express enough my deep satisfaction with this crew of volunteers. The two others directly involved in the publication of this bulletin, Stan Guzy and Bryan Hori have given this publication a very professional appearance. Retirees from other aerospace companies have seen our bulletin and they cannot believe that this is all being done by a few volunteers.

Sonnie Robertson has not only kept track of all our subscribers but she also took on the task of putting together a directory of all the 2003 subscribers that wish to be included. The task is enormous! Val Yarbrough makes all the deposits and pays all the bills. Even though we are almost fully automated, we still call upon our technical staff to step in and help us do the menial but necessary tasks and they are always ready to help.

We have also been blessed by some great writers and readers that recall and share some wonderful anecdotes. Our house historian, Norm Avery, has always provided us some marvelous stories and the pictures to go with them. Whenever we needed a short article, our guest historian from Edwards AFB, Dr. Raymond Puffer, never failed to submit a truly succinct and colorful story about a NAA/Rockwell machine. He also has provided us access to the AFFTC History Office photo library for which we are grateful. We also must mention the splendid support that we have received from the Boeing Archives office with Mike Lombardi in Seattle and Pat McGinnis in Cypress.

With all that said, I must admit that I still get a tremendous charge when I open the mailbox and find a great little vignette recalled by one of you readers or a totally unexpected story like the one sent in by William Simone about the F-107A.

We did have one of our renewal notices returned by a retiree with the notation, "I'm not renewing because I don't recognize any of the names in the Silent Majority!" Well Duh! We have made little headway in increasing the number of subscribers because of the high rate of readers joining the Silent Majority. However, we are quickly approaching 360 Silver Eagles that have signed up for lifetime subscriptions by sending in $100.00. So we must be doing something right!

We have received a tremendous response for our directory. However, we must alert you to the fact that you must be a 2003 subscriber and we must have your authorization form on file. If you don't know the status of your subscription, check your name and address on Page 16. If the year above it is 2002, this is YOUR LAST ISSUE!

Our stories in this issue include the past and the present. Tom Mackin, an NAA field rep for many years, ended up in charge of the NAA Washington D.C. office. Upon retirement, he settled in Bethesda, Maryland and became a docent at the Smithsonian's Air & Space Museum. He was, subsequently, assigned to the Garber Restoration facility where he had access to hundreds of airplanes being restored to factory fresh condition. He gives us some behind the scene insights about the museum. We have also put together the X-15 story and what that entailed to push the envelope much further than it ever was before. Finally, as a total contrast to the X-15 story, we added a letter from the International Space Station written by Astronaut Peggy Whitson after being on the ship more than four months. The X-15 objective was to achieve an altitude of fifty miles and a speed exceeding Mach 6.0. Just fifty years later, Peggy and her two fellow crew members are hurtling through Space at five miles per second at an altitude of 250 miles.

One last reminder, please do not forget to renew your subscription. If you gave a gift subscription this year, you may wish to renew the gift subscription too for 2003!

Until our next issue, stay healthy and stand in the shadow of God's Blessing!

TIIE 41ST BALD EAGLES REUNION IS COMING!
SATURDAY, APRIL 12, 2003 * PROUD BIRD RESTAURANT
FOR RESERVATIONS CALL VAL YARBROUGH AT (805) 646-2283

NAA/ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Bill Kelley at (714) 637-9374.

The Antelope Valley Retirees Club meets in the South Meeting Room of the Palmdale Culture Center at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell/Boeing retirees are welcome. For information, contact Bill "Tiny" Kisler at (661) 273-0213.

Boeing Valley Retirees Club meets on the 3rd Thursday of each month at the Canoga Park Rec Center, 8500 Fallbrook Avenue, Canoga Park, CA. The president is Jennie Muncaster at (818) 341-8919.

"The Old LAD Stress Group" meets for breakfast approximately every two months at Mimi's Cafe in Torrance, CA. If you are from the old LAD Stress Group contact Gene Laxton at (310) 378-3113 or Ed Rosenthal at (310) 375-8933.

"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meet at 11:30 AM on the 2nd Wednesday of the month for lunch at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd. and Mariposa Ave.

The NAA 101 Tooling Retirees Group meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at the Cimarron Café, 5160 190th St., west of Anza Avenue in Torrance, CA.

GPS Breakfast Club meets from 6:00 AM to 8:00 AM every Wednesday at the Primrose Restaurant, corner Seal Beach Blvd. and Westminster Blvd. All are invited. For more information, call Fred Shitara at (714) 750-1016.

Seal Beach Retirees Group meets at 11:30 AM on the 3rd Wednesday of the month at "The Fish Co." on Los Alamitos Blvd. at Katella Avenue. For more information call Marvin Blaski at (714) 848-5717 or e-mail to *mblaski@aol.com*.

The Facilities, Industrial Engineering and Plant Service Retirees Group meets at 11:45 AM on the 2nd Thursday of each month at Buster's (formerly Jolly Roger's) Restaurant in the Long Beach Marina. Contact Joe W. Mausser at (562) 596-5845.

Downey Engineering Group of Retirees known as the "Choir Boys" meets every Thursday for lunch at various restaurants from Downey to Seal Beach. Call Al Risi at (714) 892-5725 for meeting location.

"Ye Olde Pharts Breakfast Club" meets at 10:00 AM on the 4th Thursday each month for breakfast at Polly's Pies at 2025 N. Tustin Avenue in Orange. For information call Don Metzger at (949) 495-5374.

The North American Rockwell Retiree Club of McAlester, OK (a satellite of Tulsa, OK) meets at 10:30 AM on the 3rd Tuesday in March, June, September and December at the Down Town Meeting Place. Call J.A. Darden at (918) 423-0706 for more information.

Tulsa & McAlester Retirees meet for breakfast at 8:00 AM on the 2nd Monday in March, June, September and December at the Ramada Inn, 8181 East Skelly Drive in Tulsa, OK. Call Harly Phillips at (918) 838-3716.

The North American Rockwell Retirees Group of Columbus, OH Engineers and professionals meet at 11:30 AM on the 3rd Thursday of each month at the Berwick Park House. Contact Byron C. Solomides at (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH meets at Noon on the 1st Monday of the month at the Old Rockwell Park on North Hamilton Road. Contact E. Hamilton at (740) 927-5940 for information.

Autonetics Group including Marine Systems, Program Office, Project Office, System Test, Engineers and Designers meets for lunch on the last Wednesday of each month at the HomeTown Buffet, Rose Avenue and Alta Vista Drive in Placentia, CA. Call Mike Vohs at (714) 762-1925 for more details.

Autonetics Industrial Engineering and Maintenance Retirees meet for lunch on the 1st Thursday of each month at the HomeTown Buffet, 390 McKinley, located in front of the Home Depot, in Corona, CA. For more details, call Don Burt at (909) 698-0072.

Autonetics Flight Control Retirees meet at 11:30 AM on the 3rd Thursday of each month except December at "The Lamppost Pizza House" located at 17568 Yorba Linda Blvd., corner of Richfield Road, in Yorba Linda, CA. Call Jim Anderson at (714) 779-5620 for details.

Autonetics Retirees meet for lunch at 11:45 AM on the 2nd Wednesday of every month at the Rembrandt Restaurant, 909 E. Yorba Linda Blvd., Placentia, CA. All Autonetics retirees, spouses and friends are invited. Contact Robert Nease at (714) 971-7870 or e-mail to *rfnease@email.msn.com* or Ed Venanzi at (714) 779-5652 or e-mail to *EdVennz@aol.com*.

A Group of NAA Retirees meets for breakfast at 8:15 AM on the 1st Wednesday of each month at Knott's Berry Farm-Chicken Restaurant. All are cordially invited. Contact Maxine Haun at *maxi3131@aol.com*.

Autonetics Financial Luncheon Group meets for lunch at Noon on the last Wednesday of the month at Carrow's located at 100 N. State College in Fullerton. Contact Ken Cantwell at (714) 970-7171 or *Kcantwell@prodigy.net*.

A Group of Engineer Mgt. meets at 11:30 AM on the 3rd Tuesday of the month for lunch at Denny's on Imperial Hwy and the 57 Fwy. Call Ed Moran at (562) 697-9949 for information.

NAA Tech Reps Assn. (TRA) Breakfast Club meets at 9:00 AM on the 1st Tuesday of each month at the Carlsbad Airport Restaurant. For more information, call El Presidente Rafael Colunga at (760) 940-0525.

Material Group retirees from Downey and Seal Beach meet at 11:30 AM on the 2nd Wednesday every month at various restaurants. Contact Joan Dominguez at (562) 865-7200 or e-mail to *tatedom@aol.com* for location.

ANNUAL EVENTS

Bald Eagle Reunion - The 41st Annual Reunion will be held on Saturday, April 12, 2003 at the Proud Bird Restaurant. Call Val Yarbrough at (805) 646-2283.

Grants Pass Picnic - Held the 1st Wednesday after Labor Day, September 3, 2003 at Indian Mary Park in Grants Pass. Contact Bob Morse at (541) 474-1438 or e-mail to *lindabob@internetcds.com*.

Flying Horsemen - The annual reunion will be held Saturday through Monday, September 6th through 8th, 2003 at Bob and Linda Morse's home in Grants Pass, OR. Contact Bob or Linda Morse for reservations at (541) 474-1438 or e-mail to *lindabob@internetcds.com*.

The Hangar Gang - This group of retirees meets approximately every 6 months. For time, date and other details, call Gene Salvay at (818) 788-3974 or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

Annual Flight Test Instrumentation Reunion - This group of retirees meets annually at the Fullerton Elks Club. For information, call Frank Vigil at (562) 691-0236.

Tech Rep Association - A group of retired Field Service Technical Representatives has a yearly picnic in June at a park in Fallbrook. For more information, call TRA President Rafael Colunga at (760) 940-0525 or e-mail to *rafael@nctimes.net*.

The Annual M&P, P.D.L., "Friends Christmas Luncheon" - This group of retirees and employees have assembled in mid-December for a festive luncheon and gabfest for the past 19 years. Those wishing to participate and receive notice of the next December luncheon, call Fred Koeller at (310) 545-8854.

To have your group or function listed in the CALENDAR OF EVENTS, please send the information to the NAA Retirees Bulletin including identification of the group, date(s) of the event, location including address and name of contact with phone number and e-mail. Send to NAA Retirees Bulletin, 2600 Westminster Blvd., P.O. Box 3644, M/C SJ51, Seal Beach, CA 90740.

A Docent At The Smithsonian

by Tom Mackin

As you enter the main hall of the Smithsonian Institution's National Air & Space Museum in Washington D.C., you will see suspended from the ceiling the first North American Aviation X-15, 56-6670, alongside the original Wright 1903 *"Flyer"*, the Bell X-1, the *"Spirit of St. Louis"*, and the Apollo XI Command Module. On the second floor, in the World War II exhibit is what appears to be a new P-51D Mustang.

Prior to World War II, the Smithsonian had a Quonset type building on Independence Avenue with a small exhibit of World War I aircraft including a JN-4 Jenny, a DH-4 and a few more relics of that era.

As World War II was winding down, General Henry H."Hap" Arnold, then Commander of the U.S. Army Air Forces, decided that our nation should acquire aircraft and artifacts of our enemies, Germany and Japan. First to test them and then to preserve them in a national museum.

Immediately after VE Day, a team was formed in Europe to find and send back as many airplanes and weapons as they could locate. Within a few weeks, the group had assembled enough to require the Navy to send a carrier to retrieve the booty. After VJ Day, a similar operation took place in Japan.

To perform the tests, the German aircraft were sent to Wright Patterson AFB in Ohio, while the Japanese equipment was sent to the Navy's test facility at Patuxent River, Maryland. I happened to fly into Wright Patterson one day and saw my first jet airplane, an Me-262 fighter.

As the testing was completed, the planes were turned over to the Smithsonian Institution—an astounding array of 97 Allied and Axis aircraft, making it the most extensive collection in the world. The Army owned a plant in Orchard Park where the Douglas Company built C-54s during the war. This was on the site of the current Chicago O'Hare Airport. The plant was empty and was lent to the Smithsonian to serve as storage space until a museum could be erected in the Washington D.C. area.

Everything functioned smoothly until the Korean War started in 1950. The USAF, no longer the Army Air Forces, informed the Smithsonian that the facility was needed to build C-119s and that the Smithsonian should "Get your junk out of our building!"

With no time to lose, a Smithsonian curator named Paul Garber, managed to convince the government into donating a 21-acre plot in the Silver Hill area of the small town of Suitland in Maryland. The site is about seven miles SE of Washington, D.C. and two miles from Andrews AFB. With Congressional funding slow in coming and the aircraft being packed for the move, Garber persuaded Army engineers from nearby Fort Belvoir to loan a bulldozer to clear the site of trees and brush, the Navy to provide surplus prefabricated buildings and a local contractor to donate the excess cement on his trucks at the end of the workday.

Today, the facility is a no-frills complex of 32 metal buildings with 19 of them crammed full of airplanes, spacecraft and various parts. One building is devoted to restoration and three are for exhibition.

The new National Air & Space Museum opened in Washington on July 4, 1976 and was an immediate success with over one million visitors the first year with record attendance continued over the years. There are summer days when the museum must be closed temporarily because of the crowds. To accommodate the public, volunteer docents, recruited and trained, proved to be very successful in explaining the background and history of the aircraft and artifacts on display.

At the Silver Hill facility, restoration work began on the myriad of aircraft in storage. In 1977, it was decided to form a docent force and to allow the public to visit Silver Hill. However, visitors had to request specific hours with docent tours conducted once on weekdays and twice on weekends. This is where I enter the story.

Shortly after I retired in 1988, I received a card from the Smithsonian asking if I was interested in becoming a volunteer at one of its many museums in the Washington D.C. area. I responded affirmatively and was requested to come in for an interview. Because of my background in aviation, I was assigned to the Air and Space Museum.

My first assignment was to the research department which contains a library of over a hundred thousand publications from every country in the world. The museum receives many thousands of letters asking for information or photographs about aviation. I was given the task of doing the research and responding to these letters. A typical request was from a man in Arizona writing a book about transportation to the Grand Canyon. He wanted to know if the museum had a picture of an airplane used to transport people to the canyon. After a two hour search, I found a photo of an Indian in his full feathered regalia standing in front of a Fokker trimotor at the Valle Airport, located about 20 miles from the south rim of the canyon. I sent it to him and he returned the favor with a copy of his book when it was published.

After six enjoyable months, I was eating lunch in the museum cafeteria when a friend stopped by and asked me if I was happy with my volunteer job. I assured her that I was but that I would rather be a docent and talk directly to people about airplanes, their history and my own flying experiences. No problem, she said, and the following week I was on the list to begin the docent training course.

The training course took six months. After two weeks of lectures on the basics of aviation, the class was split into two groups. Those, like myself, who had been pilots were in one group and the rest in another. The reason was that the Silver Hill docents would be talking to pilots and engineers and would require a deeper knowledge of aviation than those that worked in the museum and would be addressing the general public.

We spent the rest of our training, learning the background of all the aircraft at Silver Hill. We were also coached in how to handle groups of people and how to keep everyone interested. I was assigned to a mentor and I accompanied him as he gave his three-hour tours. Soon I was talking part of the tour and, finally, was cleared for solo.

Now the fun really began! Silver Hill at the time had five buildings open for tour. One of the buildings was the restoration shop. The other four were wing tip to wing tip with aircraft from many countries. The tour was scheduled to last three hours but if it was a very interested group the tour could go beyond. My record was five hours and I was a very tired docent after walking and talking for that length of time.

What made my tours so interesting was that the visitors that came to Silver Hill were deeply interested in aviation, either because they had some connection with the aircraft or an eager interest in aviation since its beginning in 1903. Most of the tours were restricted to fifteen people per docent and that made it more personal than addressing a large crowd. There were many questions asked and many had a story of their own

to tell about their favorite aircraft.

The restoration of the B-29 *"Enola Gay"* had just begun when I began my career as a docent. After dropping the atom bomb, the aircraft was returned to the United States. In 1946, it returned to the Pacific to participate in the atom bomb tests at Kwajalein Island. However, it was not used because of mechanical problems. Upon its return, it was presented to the Smithsonian and flown to the Chicago site. From there it went to Pyotte, Texas and, in 1953, to Andrews AFB in Maryland. In 1961, it was dismantled and taken to Silver Hill where restoration began in 1984 and was completed in 1995. The aircraft was flown a total of 85 hours and is now in the same condition it was in 1945.

Considerable issues arose with some visitors during the restoration of the *"Enola Gay"*. Many times as I was describing the history of the airplane, I was interrupted by Americans claiming that there was no need to drop the bomb and that Japan was ready to surrender! My response was, "I am here to tell you about the airplane and if the bomb had not been dropped, I and possibly some of you would not be here today." That seemed to work. I had many Japanese on my tours, including the Japanese Secretary of Defense and not one made any comment on this subject.

Part of the tour included telling some of my personal experiences. In October 1944, my squadron was based on Kwajalein Island. One afternoon, the word came around that the first B-29 would be landing and everyone went out to the airstrip to see this new airplane. Out of the east came the largest airplane in the U.S. Army. On landing, the B-29 bounced something awful but the pilot recovered and brought the plane to a safe stop. Some twenty years later, I was in the Pentagon discussing strategic bombing with a Four-Star General. I happened to mention that I saw the first B-29 land at Kwajalein. "Yes," responded the general, "and he bounced the Hell out of it." I asked him how he knew that. His answer was, "I was the pilot."

The diversity of the people visiting the museum was astounding. One day I had a group from Russia. They were here to be trained on a simulator on how to control a nuclear power plant and they wanted to see the airplanes. They had a translator, a woman who knew English but very little about aviation. As the tour moved through the hangars, I explained to them how the United States provided them airplanes such as the P-39s, P-63s and B-25s to be used on the "Eastern Front." The translator stopped me and said, "We did not have an 'Eastern Front', we just had the 'Front'." That certainly straightened me out!

As we moved further, we came to the F-86A-5, AF48-260. This aircraft was one of forty-nine F-86A-5s sent to Korea early in the war. Across the hangar was a MiG-15. The translator lit up and said, "Oh! That's the plane my Dad flew in Korea". I responded, "Your Dad was not supposed to have been in that war." She just gave me a quick wink of the eye.

There always is a lot of interest in the museum's collection of the Japanese Kamikaze airplanes. The Japanese built or altered a number of aircraft to fly a single mission and to crash into their targets. One morning, as my tour began, a guard informed me that there was a Japanese news crew in the building. We found them in front of the Kamikaze exhibit. The Japanese interviewer asked me if he could interview some of the people in my tour group. I assented. He picked an elderly gentleman and asked him what he thought of the Kamikaze. Big mistake! The gentleman, suddenly, was no gentleman! He was aboard a destroyer off Okinawa when the ship was hit by a Kamikaze and many of his shipmates were casualties. After a few more attempts, the interviewer turned to me. I asked him a question, "Do you think you could get a young Japanese boy to fly one of those missions today?" No answer, he just turned and walked away.



Photo from the John Henderson Collection

The F-86A-5, AF No. 48-260, now on display at the Paul E. Garber Restoration Facility of the National Air & Space Museum located in Suitland, Maryland.



Photo from the John Henderson Collection

The F-86A-5, AF No. 48-260, on a combat mission over Korea with the USAF 334th Squadron, 4th FIW, was one of the first fifty delivered to the area aboard the mini-carrier* USS Cape Esperance. *NAA Field Rep John Henderson accompanied the aircraft to the combat zone and remained as an NAA Technical Advisor to the USAF.

About six months later, I was in the museum and one of the staff told me he had something to show me. It was a copy of what the Japanese had taped for a Japanese version of a "60 Minutes" show. And there I was asking the question about present day Japanese youth. Anyway, I was the only docent to star in a Japanese TV show.

Shortly after the Pearl Harbor attack, Admiral Yamamoto, Commander of the Japanese Combined Fleet, and his staff began working on a plan for the next move against the United States. This involved a project that included both submarines and aircraft. It was started in early 1942 but U.S. Intelligence did not become aware of it until the Spring of 1945.

A Docent At The Smithsonian

(continued on page 6)

A Docent At The Smithsonian
(continued from page 5)

The plan called for a very large submarine, 400 feet in length with a 5,000 ton displacement and a cruising range of 37,500 nautical miles. Mounted on the deck was an eleven foot waterproof tube. The tube was long enough to hold three specially designed seaplanes, designated M6A-1 and named "Seiran." Although conventional in appearance, the wings and tail surfaces folded against the fuselage. Pontoons were added after the plane was removed from the tube. It was capable of carrying an 800 kilogram bomb and was intended to bomb New York, Los Angeles or the locks at the Panama Canal.

This was not a Kamikaze effort. The aircraft could be unfolded, pontoons added and on the catapult in 7 minutes. All three airplanes could be launched in 30 minutes. A crane was provided on the submarine to recover them at the end of their mission. Development of the plan continued until 1945 with four of the 400 foot submarines completed and 28 aircraft built. Luckily for the United States considerable problems were encountered with the aircraft and the bombing mission continued to be delayed.

Finally, in July 1945, two of the submarines and their aircraft sortied for Ulithi Atoll where the U.S. fleet was anchored. One sub was sunk by a U.S. destroyer before reaching Ulithi and the war ended before the second arrived in range. The commander of this boat jettisoned the airplanes, sailed back to Japan and the sub over to the U.S. Navy.

One of the Seirans was brought to Alameda NAS in California in 1947 and remained there in storage until the early 1980s when it was presented to the Smithsonian. Restoration of the aircraft was completed in 2001. The Japanese were very cooperative during the restoration, providing original drawings and much technical advice. Looking factory new, the Seiran is now awaiting its spot in the new Smithsonian facility near Dulles Airport in Virginia.

In addition to the airplanes, the museum has a large collection of aircraft engines. The rotary engine where the crankshaft is static and the cylinders rotate was widely used during World War I by both Germany and the Allies. The metal used in these engines required the rotating cylinders for cooling purposes. The museum also has the largest piston engine. Two were built by the Lycoming Company during World War II. The engines have nine rows of four liquid cooled cylinders, for a total displacement of 5,500 inches. They were designed to take contrarotating propellers. The engines never flew on an airplane but folks of Williamsport, Pennsylvania certainly knew when they were on the test stand. The second engine is still in Pennsylvania and is owned by the Lycoming Co.

Many, many more stories could be told about the 300+ aircraft in the Smithsonian collection as well as all the countless artifacts. In fact, the airplanes themselves are considered artifacts. They have been restored to their pristine condition and look as they did new on a carrier or some airbase in the world. For example, the *"Enola Gay"* is the same as it appeared on August 6, 1945, with the exception of the bomb rack. The original disappeared somewhere over the years. A British rack was modified and replaced the one used to drop *"Little Boy"*. None of these planes will ever fly again. The museum wants them to be available for at least a hundred years.

The Silver Hill facility was renamed the Paul E. Garber Preservation, Restoration, and Storage Facility after his death in 1992 at the age of 93. The first curator, he saw it all happen from the age of 10 when he took a streetcar across the Potomac to watch Orville Wright fly the world's first military aircraft at Ft. Myer in Virginia. In 1920, he began working at the Smithsonian and for the next 72 years dedicated himself to the preservation of this nation's aeronautical heritage.

And now the Garber facility is preparing to move to a new location south of the main terminal at Dulles Airport in Northern Virginia. The new museum will be named the Steven F. Udvar-Hazy Center in honor of its major donor. The building will be situated on 176.5 acres and will include exhibit hangars, an observation tower, collections storage, classrooms, archives and a large format theater. Over 200 aircraft and 135 spacecraft will be on display including the Space Shuttle *"Enterprise"*, an SR-71 Blackbird, the Dash 80 prototype of the Boeing 707, a B-17 Flying Fortress, the B-29 *"Enola Gay"* just to name a few. The new facility is scheduled to open on December 17, 2003—the hundredth anniversary of the Wright Brothers first flight.

I have been informed that the last docent tour at Silver Hill will take place on March 31, 2003. After that date, the movement of the aircraft to the new facility will take place and, for their safety, no more visitors will be allowed. I have made up my mind that I shall not follow the planes to Dulles. It is about 30 miles from my home and old Father Time is starting to catch up. Three hour tours on concrete floors are for younger folks than me. I can't say enough how I enjoyed being a docent and being around airplanes and folks that are really interested in aviation. I soloed in a Porterfield 65 in August 1941 and it is hard to finally say goodbye.



About the author: a native Californian, having been born in Duarte, Tom began his career in 1941 at Pasadena Junior College, learning to fly in the Civilian Pilot Training Program. Finishing both primary and secondary CPT programs in 1942, he immediately enlisted in the Navy V-5 flight program. Graduating from Corpus Christi Naval Air Station on March 30, 1943 as a Marine Corps aviator, Tom spent four years in the service. Leaving the Corps after VJ Day, he moved back to California. Attending USC on the GI Bill, he was a flight instructor at Monrovia Airport. In 1947, he went to work for TWA as a co-pilot flying Constellations and DC-3s out of LAX. Joining NAA in January 1950 as a field service rep, he worked on the F-86 in several locations around the country followed by an 18-month assignment in Germany on the F-86K. He returned to cover Tactical Air Force Headquarters and NASA at Langley AFB. In 1962 he became LAD Director of the Washington D.C. Office. He left NAA-Rockwell in 1970. Today, Tom and his charming wife, Millie, reside in Bethesda, Maryland.

Building The X-15, Leaping Ahead Into Space

by Ed Rusinek

About the Article: we invited Mr. Charles Feltz to write an article about the X-15. He came up with a nameless outline because he did not wish to slight any one of the dozens of key figures involved in the X-15 program. I felt that wherever possible, the individuals should be named. In his inimitable manner, Mr. Feltz told me what I could do with the article. The X-15 was a most unique airplane, except for the conventional nose landing gear, everything about it was a new design. Perhaps, even more unique than the airplane were the people working on it. If something wasn't available, the attitude was "invent it and do it on schedule". After almost 50 years, with apologies to Mr. Feltz (I could never call him Charlie) and the unnamed many; this is, perhaps, a final salute to all of the amazing NAA people, many of whom have passed on to the Silent Majority, that have created this magnificent flying machine.



Photo courtesy of the AFFTC History Office

Moments after launch from the B-52 carrier aircraft, North American Aviation X-15 #2, 56-6671, surges ahead in a dash to reach altitude and speed during one of the earlier flights. The large nose test boom was subsequently replaced by a "ball" nose, or air direction indicator at times referred to as the "Q-Ball".

In August 1952, Bill Bridgeman flew the Douglas D558-II at Mach 1.88 and an altitude of 74,494 feet (14 miles). One month earlier, the NACA (forerunner of NASA) Committee of Aerodynamics met and recommended an increase in research on flight to 50 miles up. After two years of study, NACA issued requirements for a new research plane, designated as Project 1226, eventually to be known as the X-15. The goal was to reach 250,000 feet and to fly at Mach 6.6. At the time these requirements were published, the fastest any manned aircraft had flown was Mach 2.4. Chuck Yeager had achieved this speed in a Bell X-1A on December 12, 1953 and it almost killed him!

In supersonic flight, an increasing Mach number reduces the stabilizing effect of the tail surfaces while destabilizing forces generated by the body increase. Yeager found out about this the hard way. On his flight, he exceeded the planned maximum Mach number and crossed the line into instability. The X-1A diverged in yaw and roll and tumbled out of the sky. Yeager was able to recover and land safely. On September 27, 1956, the dangers of high speed instability became even more dramatically evident when Capt. Milburn G. Apt, USAF, flew the Bell X-2 to Mach 3.2. As he started to turn back for landing after his speed run, the X-2 went violently out of control. Both the airplane and the pilot were lost.

On January 18, 1955, representatives from Bell, Boeing, Chance Vought, Consolidated Vultee, Douglas, McDonnell, North American Aviation, Northrop and Republic met with NACA, USAF, and Navy personnel to discuss the competition and the design requirements for Project 1226. Another briefing was held on February 4, 1955 with the four prospective propulsion manufacturers: Aerojet, General Electric, North American Aviation and Reaction Motors. Between February and May, five of the nine airframe contenders dropped out, leaving only Bell, Douglas, NAA and Republic.

After months of proposal review, it became evident that NAA was the leading contender. At this point, NAA had undertaken work on two Phase 1 awards for a new fighter-bomber and a long range interceptor and the ongoing F-107 fighter effort and decided to withdraw from the Project 1226 competition unless the schedule could be extended. It was!

On December 6, 1955, the NAA LAD received a letter contract from the USAF calling for the design, construction and development of three X-15 aircraft. Even with the extended schedule, there was absolutely no time to lose. Harrison "Stormy" Storms asked Charles Feltz to head up the project as the Chief Project Engineer with two very able assistants, Bud Benner and Ron Robinson, and a host of design supervisors and designers. Directly assisting was also veteran test pilot A. Scott Crossfield who had worked for the NACA for many years and had accumulated vast flight test experience in many aircraft including the Bell X-1, Convair XF-92A and the Douglas D-558-II. His early participation in the program along with the other NAA test pilots assigned to the project led to major improvements in the X-15 human factors design envelope.

In the ensuing months, fixed base ground simulator and wind tunnel programs were initiated at the NAA LAD facility and various NACA research centers. The actual simulator had a working X-15 cockpit and control system that included hydraulic and control system hardware. It was operated via three Model 231R analog computers, 90 diode function generators, computing sensors, electronic multipliers and various other computing equipment. Eventually, some 2,000,000 engineering man-hours and 4,000 wind tunnel hours in thirteen different wind tunnels were logged to resolve a multitude of questions.

To fly as fast as it did, the X-15 had to be configured to solve the stability problems of high Mach flight. As the Mach increases, the airflow becomes increasingly affected by the powerful shock waves produced by the passage of the plane. In hypersonic flight, usually above Mach 4, the shocks dominate the airflow and dramatically reduce the lifting ability of the wings and tail. The instability can be so degrading to the aerodynamics of the vertical fins that they can no longer oversee the aerodynamic instability of the fuselage.

This was countered in two ways. The airplane had very large upper and lower vertical fins with a downward slant of the wings. The fin area was 60 percent that of the wings. The fins also had a wedge cross-section with a broad, flat, chopped-off trailing edge. The thick fuselage side strakes that contained the fuel tanks were also chopped. At hypersonic speeds, the body and strakes provided most of the lift because of the effect of shocks on the lifting ability of the wings. At subsonic speed, the wings carried most of the load.

Building The X-15
(continued on page 8)

Building The X-15
(continued from page 7)

To be launched from a modified Boeing B-52, the X-15 required conventional aerodynamic control surfaces to operate within the atmosphere. However, when flying on the fringes of space, reaction control jets, designed by Bell Aerospace, used a form of steam created by the decomposition of hydrogen peroxide for fuel. This steam was exhausted through a series of 12 nozzles, four in the wingtips and eight in the nose, to create the pitch, roll and yaw moments needed to maneuver the aircraft above the usable atmosphere.

Another area of hypersonic aerodynamics that had to be understood was aerodynamic heating. It was obvious from the start to Dr. R. L. Schleicher, the Chief Structure Engineer, that the wetted surfaces of the aircraft would be subjected to temperatures up to 1,200 degrees F and would require high strength at those temperatures. Because of its stability at high temperatures, Inconel-X was selected to cover the entire outer body. On some of the early Mach 6 flights, local peak temperatures of 1,325 degrees F were recorded.

The internal structure consisted of a variety of materials. High strength aluminum alloy was used for the inner pressure shell of the cockpit and part of the equipment bay. Titanium alloys were used for the internal structure of the lifting surfaces and fuselage. Titanium was also used almost exclusively in the aft fuselage structure. Much of the internal space of the X-15 was taken up by tanks and pressure vessels. which were subjected to extremely varied temperatures – -300 degrees F for the cryogenic oxidizer to +160 degrees F ambient in the engine compartment.

The heat load for a flight much above Mach 6 was beyond the capability of the Inconel-X/Titanium structure because airflow temperature is proportional to Mach number squared and because of the longer time required to accelerate to the higher speed. When the second X-15 was damaged in a landing accident, then rebuilt as the X-15A-2, it was coated with a spray-on ablative thermal protection material which allowed the airplane to withstand these higher temperatures.

Expending nine tons of propellants in seconds and maintaining a near constant center of gravity throughout the entire flight envelope provided another design challenge. The liquid oxygen tank containing 1,034 gallons (10,400 lbs) was located forward and the similar anhydrous ammonia tank with 1,445 gallons (8,400 lbs.) was located aft of the center of gravity. Control was maintained by expelling LOX and ammonia towards the center of gravity.

The powerplant selected to be installed in the X-15 was the Reaction Motors XLR99 which demonstrated a thrust of 50,000 lbs at sea level and 57,850 lbs at 100,000 feet. However, when development problems surfaced with the XLR99, each of the first two X-15s was completed with two of the interim Reaction Motors XLR11 engines capable of producing 8000 lbs of thrust. Propellants consisted of ethyl alcohol-water for fuel and liquid oxygen for the oxidizer, both injected under pressure supplied by a turbopump. Subsequent use of the XLR99 engines at high thrust created severe noise levels which made it necessary to design the vehicle structure to withstand high sound pressure levels up to 156 decibels at the horizontal stabilizer position.

The landing gear for the X-15 was an unconventional configuration consisting of a conventional dual nose wheel assembly and two boat-shaped steel skid main gear. The nose gear was stowed in a nose gear well and the skid gears were stowed externally. All landing gears were retracted manually while the X-15 was suspended. Extension was by gravity freefall. Since the lower vertical fin extended beyond the reach of the main gear, it was jettisoned and parachuted to the ground prior to landing.

The X-15 cockpit was unusual, even by research aircraft standards. Control was maintained by three control sticks. The first was a conventional center mounted stick which was used to control the aircraft in pitch and roll during low speed atmospheric flight. The second was directly linked to the first through pitch and roll hydraulic boost actuators and was mounted on the right side of the cockpit and operated by wrist movement only. The third was mounted on the left side of the cockpit and was used to control during exo-atmospheric flight by metering the peroxide used in the nose and wingtip reaction jets.

Cockpit air conditioning and pressurization were provided by a ram-air system from takeoff to pre-launch, by a liquid nitrogen system during X-15 flight. Helium was used to force the liquid nitrogen into an injector where it became gaseous. A mixing chamber and blower mixed and recirculated the gaseous nitrogen continuously with thermostats controlling cockpit temperature by regulating the flow of nitrogen vapor.

The pilot's full pressure suit was pressurized by gaseous nitrogen. If cockpit pressure failed, the system automatically pressurized the suit to maintain a 35,000-foot environment. A neck seal was used to separate the nitrogen pressurization of the suit from the breathing oxygen. The nitrogen flow through the suit also served to cool the pilot's body. A liquid nitrogen system designed and built by the Garrett Corporation AiResearch Division provided cooling and pressurization for the cockpit and various instrument bays using liquid nitrogen as the coolant.

The entire supply of breathing oxygen was contained beneath the seat. Two bottles provided a high pressure, 1,800 lbs per square inch, gaseous system with a 192 cubic inch capacity.

The ejection seat was a rocket propelled system, designed to permit safe ejection from 90 knots to Mach 4 in any attitude and at any altitude up to 120,000 feet. Following ejection, the pilot remained with the seat to 15,000 feet or 3 seconds, if ejection occurred below that altitude.

Hydraulic and electric power for control and flight systems after termination of the powered portion of the flight was provided by two auxiliary power units built by the General Electric Company. Driven by hydrogen peroxide, each unit supplied 40 hp through two alternator-type generators, operating at 400 cycles and 115 volts, and energized the X-15's instrumentation, powered the heating elements in the pilot's suit and throughout the aircraft, powered the inertial guidance system, computers, communications equipment, and various recording and telemetry equipment. Two transformer-rectifiers were also used to provide a 24-volt d.c. electrical system for other essential equipment.

The inertial guidance system was furnished by the Sperry Gyroscope Company. The instrumented information provided included critical attitude, velocity, distance and altitude. Later in the program, inertial systems scheduled for the ill-fated Boeing X-20 were utilized in the X-15.

A later addition was the ball nose or air direction indicator, sometimes called a Q-Ball, developed by the Nortronics Division of the Northrop Corporation. This device, a hypersonic, spherical flow-direction sensor, was a null seeking, hydrauli-

cally operated, electronically controlled servo mechanism. Pressure measurements consisting of the differential pressure of each of two pairs of static pressure ports provided angle-of-attack and angle of sideslip data and dynamic pressure.

In summation, North American Aviation built three X-15s bearing USAF designations 56-6670, 56-6671 and 56-6672. Over a ten year span, twelve test pilots flew 199 missions, carried aloft by a B-52. Five were awarded Astronaut wings. At the time the first X-15 was rolled out, no one had flown above Mach 3 and survived or flown above 100,000 feet. Before the program ended, X-15 #3 had reached 354,200 feet and X-15 #2, subsequently designated as X-15A-2, had attained a speed of Mach 6.72 (4,534 mph).

Currently, the first X-15, 56-6670, is on permanent display in the main hall of the National Air & Space Museum; the second, 56-6671, is on display at the USAF Museum at Wright Patterson AFB in Ohio. Unfortunately, on its 65th flight, the third, 56-6672, achieved an altitude of 266,000 feet at Mach 5.2, skewed off its flight path, went into a spin followed by a dive which attained structural loads of plus and minus 15 g, causing the aircraft to disintegrate with loss of the pilot, Major Michael J. Adams, USAF.



Photo courtesy of the AFFTC History Office

North American Aviation X-15 #2, 56-6671, flares for landing with all gear extended and the main landing skids touching down. The lower half of the ventral tail surface has been jettisoned during the landing approach.

These are just some of the legacies developed by the X-15 program:

- First large, restartable and throttleable rocket engine
- First translation from aerodynamic to reaction controls
- First piloted reentry-to-landing from space
- Thermal protection for hypersonic reentry
- First use of full-pressure suit for spaceflight
- An inertial guidance system
- Demonstration of a pilot's ability to operate in "micro-gravity"
- New techniques for forming and treating Inconel-X and titanium
- Improved high temperature seals and lubricants
- Use of nitrogen for cabin conditioning
- First reusable superalloy structure capable of withstanding temperatures and thermal gradients of hypersonic reentry

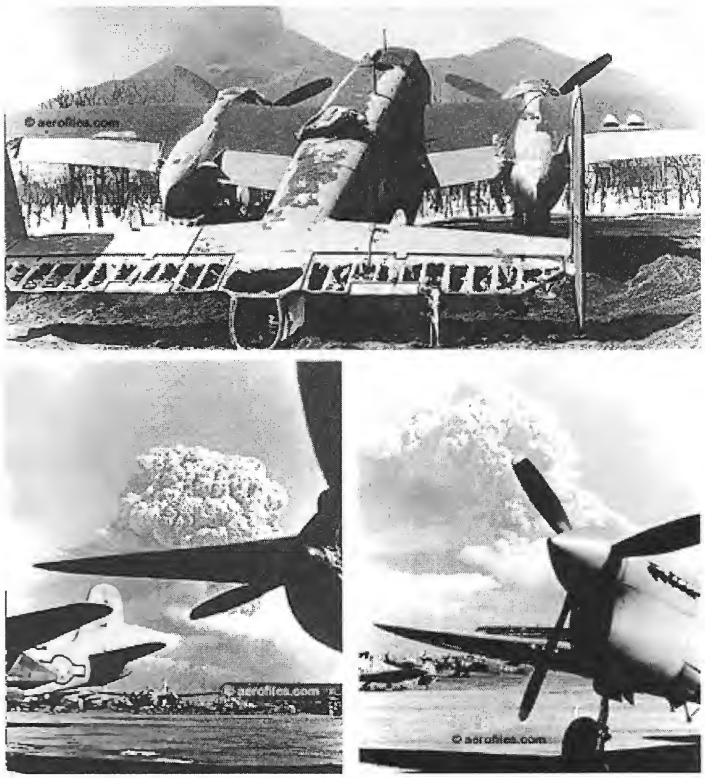
By today's standards, the X-15 program was an exceptional bargain. Total program costs including design, development, flight testing and other costs amounted to just over $300 million.

About the article: this was a very difficult article to compose because of the enormous amount of information available about the X-15 even fifty years later. Of the thousands of articles and books, the ***Aerofax Datagraph 2 – North American X-15/X-15A-2*** *provided a very comprehensive and concise report. Much of the information for this article came from that source.*

ITALY 74, USAAF 0

The enemy scored a singular victory on March 22-23, 1944 when 74 B-25s of the 340th Bomb Group on the ground at Pompeii Air Field, Italy, were damaged so badly that they had to be stricken from active records with 14 more less damaged and eventually repaired. Was it an air raid? It could be called that. Mount Vesuvius erupted, spraying rocks and volcanic debris on the base, located five miles away, accounting for more USAAF aircraft destroyed than in any single action by the Axis in WW II. Sixty-four planes were lost at Pearl Harbor on December 7, 1941, 60 on the Regensburg-Schweinfurt mission on August 17, 1943 and 54 in bombing Ploesti on August 1, 1943. In her broadcast to our troops, Axis Sally boasted, "The 340th was knocked out of the war" in what was "A clear sign that God sided with the Axis." However, the 340th moved to Paestum, 40 miles away, was reequipped and back in action five days later. And Vesuvius settled down to being its picturesque former self.

With permission from Aerofiles.



A Letter Home From Outer Space

by Astronaut Peggy Whitson



Dr. Peggy A. Whitson obtained her doctorate in biochemistry from Rice University in 1985. She continued her research as a post-doctoral fellow at Rice University until October 1986. She, subsequently, worked as a research biochemist in the Biomedical and Research Branch at NASA/JSC. Dr. Whitson became the Payload Element Developer for the Bone Cell Research Experiment aboard STS-47 and was a member of the US-USSR Joint Working Group in Space Medicine and Biology. In 1996, she was selected as an astronaut candidate and completed her two years of training and evaluation. She was assigned technical duties in the Astronaut Office Operations Planning Branch and served as the lead for the Crew Test Support Team in Russia from 1998-1999. On June 7, 2002, Dr. Whitson has been living and working aboard the International Space Station as part of the Expedition Five crew consisting of her and two Russian cosmonauts, Commander Valery Korzun and Flight Engineer Sergei Treschev. The three are scheduled to stay on the ISS for about five months. What follows is her letter home #11. The Progress *mentioned is an unmanned supply ship launched from Russia, the anticipated Shuttle is the* Atlantis *which docked on October 9, 2002.*

Hey Guys,

The *Progress* arrived yesterday. YEAH! I was surprised by the difference in my attitude about this *Progress* arrival as compared to the previous arrival, just a few days after the shuttle carrying the UF-2 crew undocked. At that time in June we had only been on station for about 3 weeks, and we still had fresh fruit from the shuttle supplies. Now at the beginning of Oct., fresh fruit and tomatoes seemed like a fantasy.

I was able to see the *Progress* approach through a small window just under the docking cone that the vehicle interfaces with to attach to the station. It's a pretty small port to be viewing from, but it was an interesting perspective to see the vehicle as it approached directly towards me. It appeared to be moving very slowly until it got within about 30 m or so when I could start seeing the detail of the antennae that are a critical part of this automated docking sequence. As the distance between the *Progress* and the station shrank, the ship seemed to be approaching more quickly (the approach profile is actually just the opposite, slower as it moves in closer). As the sun set, the silhouette of one of the solar arrays on the *Progress* sliced through the curved blue line that is Earth's atmosphere. Attitude and braking thrusters were firing, and in darkness it was possible to see the fan-shaped plume of diffused light with each firing. The station was also maintaining a very precise attitude. I could hear the double-thud of each attitude jet as it fired since many of these thrusters are located in the aft of the service module, surrounding me from my vantage point. After the soft scrape-thud of docking, as the probe on the *Progress* slid into the docking cone of the station, I watched from a window on one of the hatches in the docking compartment. Looking aft, I was able to see the attitude engines of the service module firing in an intricate dance to maintain a stable attitude.

It was several hours later, after all the appropriate leak tests were complete, that we were able to get access to the loot that folks from the ground had sent us. Of course, the vehicle was also carrying other important supplies for experiments, food for Expeditions 6 and 7, fuel for the engines and oxygen, but we were initially concerned most about the notes, letters, photos, CDs and, yes, the fresh food that arrived. Tomatoes have never tasted so succulent and apples so sweet!

I wrote you earlier about the carbon dioxide removal assembly (CDRA, pronounced ceedra) that we removed/replaced with a new bed that we brought from the ground. Unfortunately, all this work seemed for naught, since the system would not switch from absorption to desorption properly. After considerable trouble-shooting by the ground, they suspected that one of the connections was leaking. Using an ultrasonic leak detector, I was able to determine which connection was leaking, but I was not looking forward to the all-day process of rotating the rack, disconnecting the bed from behind, and removing the bed from the front to gain access to this connection. Some really bright folks on the ground asked me if I could fit behind the trace contaminant control system (TCCS) if we slid this neighboring component out (a much smaller component, easier to disconnect and no rack rotation involved). I was able to squeeze in behind the TCCS and with a flashlight in my teeth, disconnect, fix the seal and reconnect the gas line. This whole procedure took less than 1 hour as compared to the expected 1 day to access and repair if we rotated the rack. I was really excited after several more days worth of testing, that they called from the ground to tell me that CDRA was fully operational. The ground team was so happy that they generated a song and sent up the lyrics for me!

The ground medical team was interested in demonstrating the capability to use ultrasound as a diagnostic tool. We have an ultrasound onboard to be used for human research experiments that require this device. In order for this method to be feasible as a diagnostic tool, it was necessary to demonstrate that you could, with very little training (I had about 30 min), an informative cue-card and a doctor on the ground, instruct a crew member on how to get good images. The doc on the ground was receiving the images that I was generating, with a 3-4 second delay. So he had to describe to me what was a good view of a particular organ/site and I would try to obtain that for him. Once in a location, he would instruct me to pan/tilt/rotate the ultrasound probe and which keys on the complicated keyboard to use (the cue-card was color-coded and sub-divided in order to simplify these instructions). The guys on the ground seemed happy with the images I generated, and I demonstrated that I do in fact have blood flow to my head, so I was happy, too!

Communication is such a key element to success here. It can make a huge difference in how you interact with the ground and their understanding of the situation here. I can make a comment, which I might think is clear, and the ground team will try to analyze a situation that is not accurate. This week for instance, I was having problems with a couple of my computers. I reported that I had a green flashing light, indicating that the computer was communicating with the network. Based on this comment, the ground assumed that I had

taken that computer from a radio frequency connection and made it a hard-line connection. I'm sure they were sweating bullets to try and understand why I would have changed the configuration of the network without telling them, so eventually they asked me why I had done this. It was ironic that after explaining that in fact I had not changed the configuration of the network, the next trouble-shooting step was to change the configuration of the network to make this computer hard-line...

We have been doing a number of activities in preparation for the shuttle arrival. In order to be optimally efficient during the short period of time that the shuttle is docked to the station, the ground team sends me a list of items to pack in advance, so that for the most part, all that is required is some transfer once the shuttle arrives. This is not a job on the ground I would really want...it requires an immense amount of patience and an incredible eye for detail. The lists the ground sends up are preliminary, and they tell me on a day-to-day basis which items have been approved so that I don't waste time packing items that the shuttle won't be able to take home because of mass and c.g. (center of gravity) issues. On the previous flight we had an entire logistics module to transfer, but because the truss that is coming up on this mission fills the payload bay of the shuttle, there is no room for a logistics module...this makes logistics simpler in some ways, but more complicated in other ways. There are fewer items to be transferred, but changing priorities can have a greater impact with less total volume available. I consider myself pretty lucky that I've only unpacked 2 bags so far that I had previously packed!

We are also preparing the airlock, the suits and the tools for the shuttle team that will be doing the EVAs from the station. These tasks are interesting, so it's fun to do them. The most challenging part was figuring out where to put everything that we normally have stowed in the crewlock (the portion of the airlock that the crew egresses the station, which when not in use, is FULL of equipment/spares/tools). Even though we moved a lot of items from the node to the FGB to open up some space for the airlock items, the node looks like a disaster area with all these items from the crewlock and the pre-packed items that I have temporarily stowed there, too. *Progress* unpacking is proceeding well, so the FGB doesn't look any better. Typically, when you have houseguests coming, you try to tidy up...not going to happen here!

Mr. O'Keefe also came to Mission Control in Houston a couple of weeks ago and announced that I was to be the first Science Officer of the ISS. I obviously don't mind the new title, in spite of the fact that my many supportive friends have sent an incredible amount of Star Trek/Mr. Spock-related email!

Live Long and Prosper,
Peg

Funny moments were shared sometimes by the X-15 test pilots, as the following account by Milton O. Thompson illustrates:

"Shortly after launch on Scott's (Scott Crossfield) fourth flight, one of the rocket chambers exploded, causing an engine bay fire. Scott shut down the engine and began jettisoning propellants while setting up for an emergency landing on Rosamond Lake. Due to the steep nose-down attitude during the landing approach, Scott was unable to jettison all of the propellants. He touched down at a low speed in a nose-high attitude with a considerable amount of propellant in the tanks. When the nose slammed down, the fuselage buckled just behind the cockpit. The airplane slid out on its nose gear, belly, and main gear skids. Scott's only injury was to his pride. It definitely was not his best landing."

"Scott still tells the story about his tug-of-war with the flight surgeon after the aircraft came to a stop. The flight surgeon aboard the rescue helicopter overheard someone say something about a broken back. The comment actually referred to the aircraft, but he assumed that Scott's back was broken as a result of the landing accident. When the rescue helicopter landed next to the X-15, the flight surgeon jumped out with a backboard and ran up to the X-15 cockpit to rescue Scott from the burning plane. Scott had partially opened the canopy in preparation for an evacuation of the aircraft. The flight surgeon decided that he had to get the canopy out of the way to get the backboard on Scott before moving him from the cockpit. The flight surgeon pushed the canopy up to open it further. When Scott realized what the flight surgeon was doing, he grabbed onto the canopy in a desperate attempt to hold it down since he knew that excessive canopy motion would arm the ejection seat. He did not want to be ejected accidentally after surviving an explosion, a fire, and an emergency landing. Scott could not talk to the flight surgeon since his faceplate was still closed. The two highly motivated individuals struggled mightily—one pushing, the other pulling on the canopy, both attempting to save Scott's life. After a minute or two of this Herculean effort, the flight surgeon finally gave up. He rationalized that Scott could not be seriously injured if he could pull that hard on the canopy."

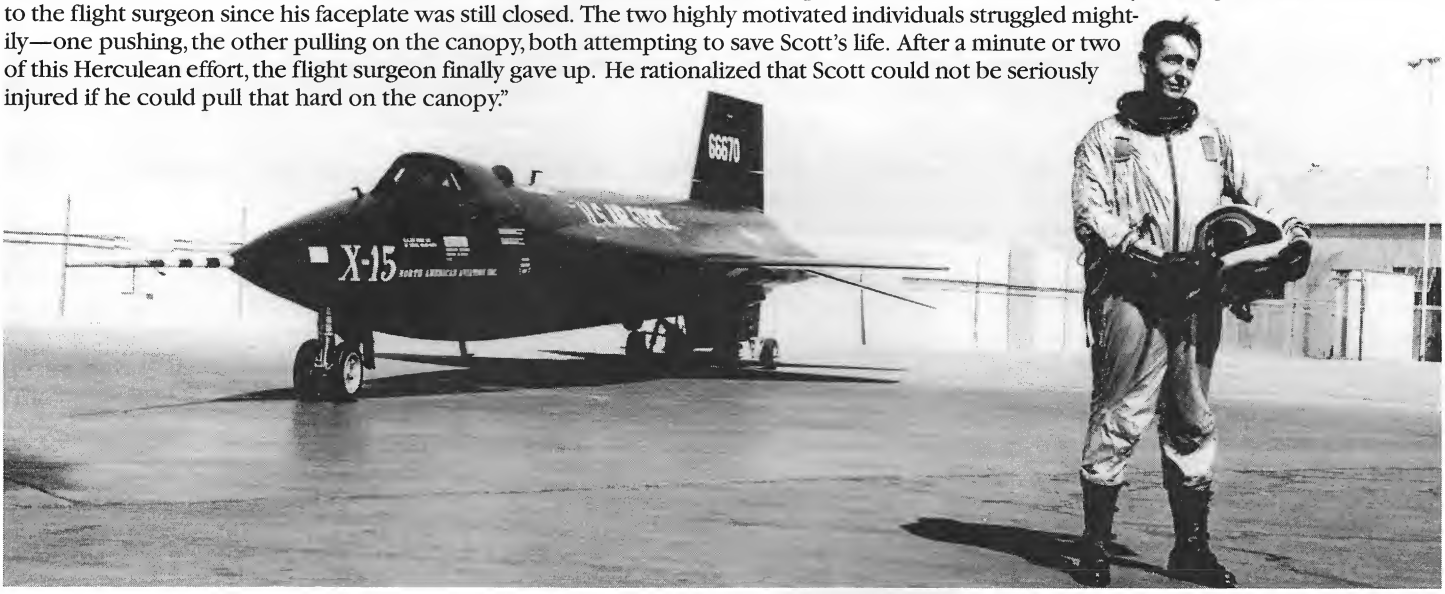


Photo courtesy of the AFFTC History Office

The Machine and the Man—North American Aviation X-15 #1, 56-6670, and Test Pilot Scott Crossfield poised, during rollout ceremonies in October 1958, to fly higher and faster than man has ever done before. In this initial phase of the program, the aircraft was painted semi-gloss black overall with a large test boom equipped with pitch and yaw vanes.

The Silent Majority

by Stan Guzy

ANDERSON, DEAN A., – died on May 27, 2001. Subscription renewal letter returned marked "Deceased". No further information available.

ARAGON, MANUEL F., 82 – passed away on June 19, 2002 from stroke complications at the Ramona Manor Nursing Center in Hemet, CA. He had worked in engineering liaison at Rockwell International for 23 years before he retired in 1984. He is survived by his loving wife, Margaret.

BARDOS, CHARLES, 96 – died on August 4, 2002 at Hemet Valley Medical Center in Hemet, CA. He had been an inspector for NAA/RI in Downey, CA for 30 years before his retirement.

BERES, PAUL W., – directory card returned marked "Deceased" April 5, 2001. No further information available.

BETCONE, HANNAH V. SINCLAIR, 86 – died on September 17, 2002 at Life Care Center in Vista, CA. She had been employed by NAA/LAD, in the insurance department for 17 years. She is survived by her husband of 35 years, James.

BILES, DELMONT W., 92 – of Sun City, CA, died September 14, 2002 of causes unknown. Del held various assignments in human resources for 25 years prior to his retirement in 1975.

BOUDREAU, JR., HENRY J., 81 – died of complications from heart disease at Inland Valley Medical Center in Wildomar, CA. He worked in personnel management/human resources at Rockwell International for 22 years.

BOWMAN, LEROY S., 68 – died July 12, 2002 of a ruptured aortic aneurysm at Beverly Health Care in Murrietta, CA. He had been a design engineer for Rockwell International for 30 years.

BOZORA, BERTHA "BERT", 78 – died April 20, 2001 in Lawndale, CA after a brief illness. Burial was in her home state of Wisconsin. Information was provided by her friend and neighbor, Paul Arness.

BURRETT, MELVIN C., 90 – died in Sun City, AZ on October 11, 2002 of cancer. He was a design engineer at Autonetics and did much of the work on the heads up display and crewman optical sight. All of the photos and mementos of his career were lost during a fire. His wife, Ellie, would appreciate hearing from any of his colleagues that may have retained anything related to Melvin's work. She can be reached at (626) 546-9611.

BUSTAMANTE, RALPH J., 71 – passed away September 3, 2002 of unidentified causes in Torrance, CA. He worked at Rockwell International as a manager of quality control for 30 years. He is survived by his loving wife of 43 years, Marta.

CHRISTIANSEN, MILTON H., – renewal post card returned marked "Deceased" May 26, 2001. Retired from NAA/LAD in 1986 after 39 years of service. No additional information is available.

CLEMMER, JANETTE S., 84 – died August 18, 2002 of melanoma. Jan hired into NAA/LAD in 1951 and later married Bob Clemmer, an inspector at LAD. Jan had enjoyed good health and was very active until her unexpected passing.

COLE, EARL G., 77 – died August 27, 2002 of kidney failure. After graduating from MIT, Earl began his career with NAA in July 1951 at the Downey facility. In 37 years of service at NAA/RI he had held nine key positions in program areas including the Navaho, Apollo and the Space Station projects. Earl was known as a kind and thoughtful person who gladly provided mentoring to various colleagues and fellow employees. He is survived by his loving wife, Donna.

CROW, WILLIAM F., 68 – died July 31, 2002 at his home in Reynoldsburg, OH. Cause of death was a series of strokes complicated by attendant cancer. Bill had worked as an avionics engineer on electronic integration programs and testing plans for several aircraft systems. He retired after 33 years of service and is survived by his wife, Marjorie.

DERUS, NATHAN M., – directory card returned indicating Nathan passed away on May 29, 2002. No further information provided. Sent in by Helen Severson.

DODDS, ROBERT "BOB" E., 88 – passed away peacefully at his home in Laguna Woods, CA on September 29, 2002. He was part of Dutch Kindelberger's "dream team" and a member of Harold Raynor's staff. He retired after 39 years of service at LAD. He is survived by his loving wife of 60 years, Dorothy.

EIDSMOE, ALLAN M., 80 – died March 27, 2001 in Escondido, CA. Directory card returned by his loving wife of 58 years, Sue.

EVANS, BRIAN P., 49 – died August 18, 2002 at Loma Linda University Medical Center in Riverside, CA. He worked for NAA/RI in Seal Beach for 31 years.

FERAZZI, PAUL A., 73 – died August 30, 2002 of pneumonia and complications arising from a prior stroke. He worked in electrical design on the Apollo and Space Shuttle Projects. He was a past president of the NAA/RI Management Club. After retiring, he took training and became an Emergency Medical Technician (EMT), serving during the LA riots. Paul is survived by his loving wife, Shirley.

FIKSE, HENRICH E. "HANK", 82 – directory card returned indicating "Deceased July 2002". Died in Moneta, VA of leukemia on July 12, 2002. Although most of his career was in finance management at Autonetics, he retired from Corporate General Offices in Pittsburgh, PA.

FIRTH, SHIRLEY ANN, 80 – died August 31, 2002 of natural causes. She had retired as a planner for NAA/RI. She is survived by her loving husband, Frank.

FOSTER, EARLE E., 76 – passed away on November 5, 2002 in Las Vegas, NV of heart disease. During his career in contracts, he worked at Downey, Seal Beach and LAD facilities. He retired after 28 years and is survived by his loving wife, Georgine. We were informed by his good friend, Dick Pierce.

GRISSO, WAYNE E., 86 – died October 29, 2002 of natural causes. He had worked as an aerospace technician at Rockwell International.

HARDING III, FRANK W., 74 – died August 11, 2002 of arteriosclerosis in his sleep at his home in Irvine, CA. He had served as a director of Major Subcontract Procurement on the B-1B program. He is survived by his loving wife, Diane.

HAGER, MARGARET, 83 – passed away in Paso Robles, CA on July 25, 2002 after a brief battle with cancer. She had worked at LAD and Space Division. She was preceded in death by her husband, George, who was also a Rockwell employee. We were notified by Chuck Pernu.

HALFERTY, FLOYD D., – directory card returned marked "Deceased August 19, 2001". No further information available.

HOBBS, ROBERT, 78 – died August 30, 2002 at his home in Cypress, CA after a long bout with cancer. Robert began work with NAA as a mechanical engineer in 1950 and retired from the hydraulics group in Downey, CA. Information was provided by his loving wife, Stella.

JACOBS, JUNIOR CLIFTON, 70 – died September 20, 2002 of causes yet to be determined. He had worked as a senior engineer for NAA/RI. He is survived by his loving wife, Angela.

JOHNSON, MEL, 89 – passed away in mid-August, 2002 after a lengthy treatment for pulmonary fibrosis. Mel had worked as a supervisor in the photography department at LAD for many years. Sent in by Bob Briskert.

JONES, ARNOLD D., 67 – died September 3, 2002 of a brain tumor at his home in Murphysboro, IL. He had over 35 years of service with NAA/RI in quality control and at various facilities and divisions. He retired as manager of quality control. Information sent in by his loving wife of 36 years, Teddie.

KIMSEY, KEN – died on October 12, 2002 in Cerritos, CA from an accidental gunshot wound while cleaning his gun in his garage. Ken worked in the computer data processing unit and was involved in many of the Apollo missions. He retired after 37 years of service and is survived by his loving wife, Melinda.

LEINE, THEODORE "TED", 83 – died August 23, 2002 of congestive heart failure at his home in Vandenberg Village in Lompoc, CA. He was employed by NAA as an engineer for 38 years before he retired in 1979. Ted had held many key posts on various major programs in his tenure with the company. He is survived by his loving wife, Patricia (Pat), who is also an NAA retiree.

LEPPANEN, MICHAEL – passed away on October 12, 2002 in Santa Ana, CA. When he retired in 1988, his career in aerospace spanned 40 years including service at Autonetics and Seal Beach. He is survived by his loving wife, Alice.

LOW, CHOCK, 87 - died August 4, 2002 in Torrance, CA of undisclosed causes. He had worked in the Production Development Lab at LAD for over 30 years. Reported by Jim Hurzeler.

MARTINEZ, ISAAC C., 81 - died May 21, 2002 of undisclosed causes. He joined Autonetics in 1958 and retired in 1990. He is survived by his loving wife, Mary.

MCLEOD, JOHN, 73 - died August 25, 2002 of undetermined causes. He was an NAA/RI retiree. No additional information was made available.

MELLINGER, GEORGE R., 88 - died September 3, 2002 of undisclosed causes in Escondido, CA. He began his career with NAA in 1940 after graduating from Caltech. He put his engineering skills to work immediately on the P-51 program. He became Manager of Experimental Flight Test and was directly involved in the successful completion of critical testing on several planes including the P-51, F-80, F-86, and F-100. His career included work on the XB-70 program and the X-15 project. He is survived by his loving wife of 64 years, Elizabeth.

MITCHELL, WAYNE W., 60 - died July 28, 2002 of a heart attack. He was an employee of NAA/RI/Boeing.

MOLLER, RICHARD "DICK", 81 - died in Capistrano, CA on June 4, 2002 of cancer. Although most of his career was at Autonetics, the last five years were spent at Corporate General Offices in Pittsburgh, PA.

MUCCIA, DANIEL D., 87 - of Oceanside, CA died on October 21, 2002 at the Scripps Hospital in La Jolla, CA of heart disease. Danny worked in Shipping at LAD from the AT-6 to the B-1. He is survived by his loving wife, Ruth. We were informed by his good friend, Chet Mozena.

OLDFIELD, KENNETH L., 86 - died September 15, 2002 at Hemet Valley Medical Center in Hemet, CA. He worked for NAA/RI for 36 years until he retired in 1976. He is survived by his wife of 64 years, Floretta.

OLSEN, OWEN K., 84 - died August 14, 2002 at his home in Wildomar, CA. He had been a mechanical engineer for Boeing/NAA and worked on the propulsion system for the Space Shuttle before his retirement in 1983. He is survived by his wife of 59 years, Dorothy.

POLLARD, HARRY F. "BUD", 76 - passed away on September 12, 2002 in a hospital in San Luis Obispo, CA from complications resulting from a recent surgery. Bud had worked for NAA/RI for 33 years when he retired from the Space Division in 1981. He served as a technical representative on the B-45 and the F-86 programs in the U.S. and overseas in Japan and Denmark. He held various key positions in logistics management at the Missile/Space Division before his retirement. He is survived by his wife Barbara of Paso Robles, CA.

POWERS, HARRY P., 84 - died July 31, 2002 at the Eisenhower Convalescent Home in Pasadena, CA following a short illness of undisclosed nature. He joined NAA in July 1941 and retired in 1970 as a Senior Management Systems Analyst. The information was sent in by his loving sister, Mary Powers Miller of Amherst, Ohio.

PRIME, ELLIS R., - subscription reminder letter returned marked, "Deceased January 5, 2002". No additional information available.

PULLFREY, JOANNE ORA, 73 - died November 1, 2002 of cancer in Yorba Linda, CA. She was a retired NAA/RI bookkeeper and is survived by her husband, Howard.

QUACKENBUSH, ROBERT L., 74 - died September 2, 2002 at the Health and Sciences University Hospital in Portland, OR of undisclosed causes. He had been an aeronautical engineer with NAA/RI.

REYNOLDS, JOHN C., 85 - died August 30, 2002 of natural causes. He was a retired contract administrator at Rockwell.

REYNOLDS, LYNDEN E. "GENE", - died August 8, 2002 after a courageous battle with prostate cancer. He worked at the Columbus Division for 34 years as an industrial engineer before his retirement. Information provided by his wife, Evelyn.

ROSE, DAVID A., 70 - died July 31, 2002 of undisclosed causes. Dave had worked for NAA/RI for 20 years in engineering administration. He is survived by his loving wife, Shirley.

RUCHTON, HARRY G., 78 - died October 14, 2002 of natural causes. He was a retired shipping clerk for NAA/RI.

SCHARDIN, RAYMOND G., 82 - died quietly in his sleep on August 7, 2002. He retired as a structural engineer with NAA/RI, having spent most of his tenure with Atomics International working on the Space Shuttle Project. He is survived by his loving wife, Ruth.

SCHEMENSKY, HOMER D., 73 - died of cardiopulmonary arrest on September 27, 2002. He had worked as an engineer at RI.

SEARCY, WILLIAM E., 74 - died June 6, 2002 at Inland Valley Regional Medical Center in Murrieta, CA. He had been a research engineer at RI in Anaheim, CA prior to his retirement in 1990. He is survived by his loving wife of 36 years, Mary.

SEIFRIED, RICHARD - died of cancer on July 2, 2002. Renewal card returned by daughter, Wendy.

SEILER, MARIE A., 81 - died recently at her daughter's home in Nuevo, CA. She had worked for NAA/RI for 10 years before she retired in 1980.

SHEFFER ROBERT D., 84 - passed away on February 7, 2002 of natural causes. Bob joined NAA in 1950 and retired in March 1982 from Logistics Services in Anaheim, CA.

SILER, ALBERT E., 90 - died October 24, 2002 of natural causes. He retired as an electrical engineer for NAA.

SIMS, JAMES B., 78 - died August 6, 2002 at his home in Hemet, CA. He had been an electrician at RI and worked on the Apollo Program. He is survived by his loving wife of 17 years, Margaret.

SPENCER, LEE R., 82 - died on September 20, 2002 in Oroville, CA. He had worked in planning at LAD and retired in 1978. We were informed by his loving wife, Flora.

THRUSH, LEONARD E., 91 - died October 8, 2002 of natural causes. He had retired as a manager for Rockwell.

TIKOTSKY, BENNETT, 82 - passed away on May 6, 2002. Directory card returned by his daughter, Wendy.

VOJTA, FRANCIS J. "BUD", 75 - passed away on February 7, 2002 in Las Vegas, NV. Bud joined NAA at LAD in 1951. He worked in Anaheim, CA most of his career and retired from logistics in May 1985.

WATERS, MILTON R., 68 - died of a heart attack at Little Company of Mary Hospital in Torrance, CA on August 30, 2002. He worked at NAA/RI as a mechanical/design engineer for over 36 years before retirement. He leaves behind his loving wife of 45 years, Eileen.

WIGHTMAN, ROBERT R., 83 - passed away quietly in a Torrance, CA hospital on November 3, 2002. Bob worked in configuration management at the Downey facility on the Apollo and Space Shuttle programs. He is survived by his loving wife Doris. We were informed by his friend, William "Ole" Olson.

WINCHESTER, ROBERT C., 79 - died August 8, 2002 of unspecified causes. After an exemplary career in the Air Force, Robert joined RI as a project engineer at KSC. After a short time, he was appointed Director of Personnel for Florida Operations, the position he held until his retirement in 1982. Sent in by T.J. O'Malley.

WOLFINGER, PAUL E., - of Lancaster, OH, passed away on September 10, 2002. We were notified by his daughter-in-law Ona Wolfnger.

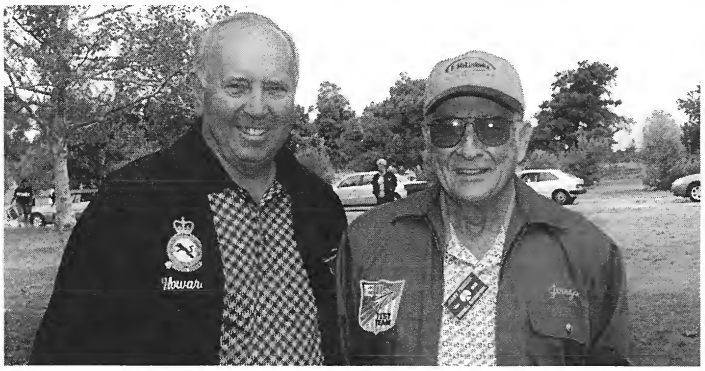
WYMORE, SHIRLEYBELLE, 66 - passed away on January 9, 2002 at her home in La Mirada, CA of cancer. She retired in February 2001 after 36 years of service in Property Management at the Downey facility. She is survived by her loving husband, Buddy, who is also a NAA/RI retiree.

ZELON, MILTON H., 76 - died at his home in Murrieta, CA of undisclosed causes. He had been an engineer at the Downey facility of NAA/RI for 40 years and worked on the Apollo and Space Shuttle programs. He is survived by his loving wife of 50 years, Irene.

PAX DOMINI SIT SEMPER VOBISCUM

First Annual B-1 Picnic

More than 75 past and present B-1 employees attended the first annual B-1 picnic held on September 29, 2002 at El Dorado Park in Long Beach, CA. Many functions including Material, Engineering Finance, Quality and Manufacturing were represented. Planning has already started for next year. For information, contact Lee French at (562) 866-9435 or e-mail *lelandfrench@.attbi.com*.



Howard Chambers & Jerry Finstein



John Pierro, Scott White, & Art Goudreault



Maxine Harstine & Delores Prather



Ellie ?, Suzie Lugo, & Lyn Isomoto

Grants Pass Picnic

The yearly NAA/RI Retirees Picnic held on Wednesday, September 4, 2002, at Indian Mary Park in Grants Pass, OR drew 68 retirees and families. Events were preceded by a silent prayer for old friend and attendee, Al Kustra, and for committee members, Charlie Wolfe and John Sheridan. After a very active day including a very competitive horseshoe contest, 39 still managed to attend the dinner at The Brewery Restaurant. The following came to this yearly get-together: Marlin & Diana Albert, Ray & Nora Bannard, Ima Blezek, Jack & Gerry Borger, Bob & Gloria Cragin, Audrey Dalton, Gloria Farquhar, Al & Louise Foster, Bill & Ida Francis, Don & Carrie Harn, Harold & Betty Hayes, Erv & Daisy Haynie, Dale Heiss, John & Florence Hoffman, Walt Jones, Gil Judson, Bob & Renee Leedy, Ralph & Bev Leonard, Howard & Donna Liechty, Larry & Bette Livers, Danny & Vera Lopez, Tom & Cat Mauldin, Joe May, Gerald McGee, Gene Miles, Helen Mills, John & Janis Monko, Robert & Linda Morse, Howard Nelson & Joan Ives, Dick Normandin, Elda Peterson, Charlie & Alice Palmershee, Earl & Virginia Preshaw, Milo Price, Evan & Loretta Shriner, Russ Smith, Bill & Helen Snider, Louise Stokes, Joe & Ann Trimm, Neal & Esther Weddle, Joe & Betty Witkowski, and Herb Wilson.



Horseshoe Contest Winners were for the ladies: Linda Morse (3rd Place), Ima Blezek (2nd Place), Ida Francis (1st Place); for the men: Bill Snider (1st Place), Bill Francis Horseshoe Contest Chairman, Evan Shriner (2nd Place) and Don Harn (3rd Place).

North American Flying Horsemen Reunion

The 18th annual reunion of the North American Flying Horsemen was held on Tuesday through Thursday, September 17-19, 2002, at the Konocti Harbor Resort and Spa in Kelseyville, CA. Bob and Linda Morse hosted the reunion with the help of Charles and Shirley Morse, Tim and Audrey Corkery and Steve and Nancy Snow. The group received a plaque from H.O.P.E. Ranch (Horses Offering People Excellence) in recognition of the annual contribution made to the Adopt-A-Rider program. Our sponsored rider, a girl with one arm and an artificial leg, is making tremendous progress in establishing self-esteem, control and a desire to succeed. It is anticipated that she will shortly be competing on horseback in the show ring.



Back Row (L to R): Marilyn Mocium, Stan Mellin, Nancy Snow, Steve Snow, Marlin Albert, Diane Albert, LaVonne McQuilkin, Fred McQuilkin, Linda Morse.
Front Row (L to R): Ted Mociun, Jim Walsh, Bob Morse, Harry Shapiro, Tim Corkery, Audrey Corkery.
Not in Photo: Charles, Shirley and Paul Morse, Jim Rodriquez and Friend.

2003 NAAR DIRECTORY

by Sonnie Robertson

The response to the 2003 NAAR Directory has been, to say the least, OUTSTANDING! Thank you all for your participation. Without you we wouldn't have a Bulletin nor a Directory. To those of you that have not had your Directory checks clear, I apologize. Inputting information to the database takes quite a bit of time. Be patient! Also, because I made the "fill in" space so small, it has been difficult deciphering some of the information. As some of you know, those that I can't read, I have sent letters asking for confirmation and/or correction of the information. If corrections are required, please return them as soon as possible. Next time, spacing will be larger!

Please note: the Directory is available only to those that have NAAR Bulletin subscriptions through December 2003 or later, i.e., December 2004, 2005, etc. Check above your address on this issue to verify your subscription expiration date. If it indicates that your subscription expires December 2002, please renew by December 31, 2002.

For those that have not sent in your checks/information, the deadline is December 31, 2002. I'm sorry, but after that date we cannot accept any entries. After that date your checks will be returned. For your convenience you may use the form below.

NAAR DIRECTORY
RETIREES BULLETIN OFFICE
THE BOEING COMPANY
P.O. BOX 3644, M/C SJ51
2600 WESTMINSTER BOULEVARD
SEAL BEACH, CA 90740-7644

Publication of the NAAR Directory will be once a year. First issue is planned for January/February 2003. To be included in the 2003 NAAR Directory, the following form must be filled out. No entries will be accepted by telephone, e-mail or fax. Fill out the information below, sign and return by December 31, 2002. Include a check payable to: Bald Eagles, Inc. in the amount of $3.00 (to cover printing and mailing costs). Note on check: For NAAR Directory. Mail to the above address.

DIRECTORY ONLY AVAILABLE TO 2003 (AND LATER) NAAR BULLETIN SUBSCRIBERS

I would like to be included in the NAAR Directory and give permission for the following information to be published.
NOTE: INCLUDE ONLY THE INFORMATION YOU WISH TO HAVE PUBLISHED.

NAME: _____ SIGNATURE: _____

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E-MAIL ADDRESS: _____

YEAR RETIRED: _____ FROM: _____ DIVISION: _____

AFTER: _____ YEARS OF SERVICE

WE GOOFED!

IF YOU HAD TROUBLE ORDERING THE BOOK "MiG ALLEY – Sabres vs. MiGs Over Korea"
WE HAD A TYPO IN THE ADDRESS
THE CORRECT ADDRESS IS:

JOHN L. HENDERSON
1015 S. HORIZON DRIVE
VENTURA, CA 93003-1416
(805) 658-7255

RETIREES BULLETIN OFFICE
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RETURN SERVICE REQUESTED

North American Aviation Retirees Bulletin

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Photo Courtesy of the Boeing Historical Archives

Delivery of F-86F-30s to Korea—the foredeck of the carrier* USS SITKOH BAY *(T-CVE-86), with the Yokohama port crane preparing to attach and hoist 52-4800, an RF-86F-30NA, Project HAYMAKER Photo-Reconnaissance SABRE, off the carrier deck. This RF was one of eight built and modified at LAD very late in the Korean War. The aircraft was then ferried across Tokyo Bay to Kisarazu Air Base, Japan where it was cleaned, prepared for fly-away and test flown before transfer to Korea. 52-4800 was delivered to the 15th Photo Reconnaissance Squadron, Kimpo AB, Korea in July 1953, too late for combat.
Caption by NAA Field Rep John Henderson

A Bald Eagles Inc. Publication

North American Aviation Retirees Bulletin

Spring 2003

Inside:

NATIV – NAA ENTRANCE INTO THE SPACE AGE by Jeff Schmidt
HAVING THE BEST JOBS IN THE COMPANY – PART II by Albert (Al) Martin
A STENO IN THE OLD LAD STRESS GROUP by Jeanette Orgill
THE NAA F-86C/YF-93 PENETRATION FIGHTER by Larry Davis
THE F-108 RAPIER – A TRIPLE-SONIC INTERCEPTOR by Erik Simonsen



NASA Photo

In Memory of the STS-107 Crew of Space Shuttle "Columbia"

Rick Husband · William McCool · Kalpana Chawla · David Brown
Michael Anderson · Laurel Clark · Ilan Ramon

NORTH AMERICAN AVIATION
Retirees Bulletin

NAAR BULLETIN, an affiliate of the **Bald Eagles, Inc.**, is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAAR bulletin office is located at The Boeing Company, Seal Beach facility. Send mail to:

Retirees Bulletin Office
2600 Westminster Blvd.
P.O. Box 3644, M/C SJ51
Seal Beach, CA 90740

Or Phone: ☎ (562) 797-3836
Or Fax: (562) 797-3848

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Yes, I am a retiree of NAA/Rockwell and I want to subscribe to the NAA Retirees Bulletin. I am enclosing a check payable to the **Bald Eagles, Inc.** for $_____. For every $10.00 I will receive four issues per year. For $100.00, I can become a Silver Eagle with subscription for life.

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I retired from _____ Division after _____ Years of Service

Also, please send a **2003** gift subscription to:
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I am enclosing payment of $10.00 per year and I understand you will send a gift card to recipient.

DEAR NAA RETIREES BULLETIN SUBSCRIBER

As I sit down to write this commentary to you, our subscribers, my heart is again filled with sadness upon hearing about the loss of Space Shuttle *"Columbia"* and its magnificent crew. Those of us that were closely associated with the NAA space programs, recognize that space flight is not a simple exercise in travel. It is still a very dangerous venture and sometimes a bad thing will occur. Knowing that, it still does not lessen the pain when it happens.

If you have been trying to reach us by phone these past six weeks without success, it is because Boeing has moved us to a new location at the Seal Beach facility and our phone was disconnected during most of that time. We are now located in one of the trailers near the employee fitness center.

We start the new year with the passing of another giant of the industry. Charles Feltz passed away suddenly on January 3rd of a heart attack. He was an outstanding engineer and recognized leader on the X-15 and Apollo programs.

We begin the new year in this issue with several articles about the early days of the North American Aviation entrance into the Space Era. It is a story of failures and disappointments, but it is also a story of intuitive genius and inspiration. When WWII came to an end, the aviation industry came to a sudden screeching halt! Production lines were halted and most of the workers and engineers were laid off. Always a visionary, "Dutch" Kindelberger kept a nucleus of engineers to design the Navion. It was a beautiful little airplane but not exactly a barn-burner in sales for that timeframe. Within a few short years, he formed the Aerophysics Laboratories and moved a group of engineers to the NATIV program. It was a primitive start but it was also the beginning of a totally new industry! Jeff Schmidt provides us a terrific glimpse on what it was like. After the NATIV, came the NAVAHO and with it, further advances leading to Space. Al Martin continues his report on the NAVAHO, which in itself could be considered a failure, but it brought a fantastic gold mine of riches in the advancement of knowledge needed to fly higher and faster than ever before and to the Moon and back.

Since most of us started at NAA with a slide rule, a pad of NAA vellum and a sharp pencil, you might enjoy a return to the old days with a short story by Jeanette Orgill about life in the old LAD Stress Group before the desk computers came in to play.

When you speak of North American Aviation, the airplanes usually mentioned are the T-6, P-51, B-25, F-86, F-100, B-70 and the B-1. In this issue, we bring back two NAA airplanes which for whatever reason, did not survive the proverbial cut, the YF-93 and the F-108. With the F-108 story, we introduce to our readers another wonderful historian, writer, photographer and artist—Erik Simonsen. We think you will enjoy his stories and his photographs in this and future issues.

Until our next issue, stay healthy and may you stand in the shadow of God's Blessing!

THE 41st ANNUAL BALD EAGLES REUNION IS COMING!

Saturday, April 12, 2003 at the Proud Bird Restaurant
located at 11022 Aviation Blvd. (At 111th Street)
Doors open at 10:00 AM for Social Hour
with seating for Lunch at 12:00 Noon
Please send your check for $20.00 per person to **The Bald Eagles** to:

VAL YARBROUGH
620 DEL ORO DRIVE
OJAI, CA 93023-1805
(805) 646-2283

Include with your check the name you want on your badge and the name of each guest for whom you are ordering a ticket.
Tickets and badges will be issued as you register at the entrance.
Sorry! There will be no refunds after March 24, 2003.
Parking is limited—car pooling and early arrival is suggested.

See you there!

NAA/ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Bill Kelley at (714) 637-9374.

The Antelope Valley Retirees Club meets in the South Meeting Room of the Palmdale Culture Center at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell/Boeing retirees are welcome. For information, contact Bill "Tiny" Kisler at (661) 273-0213.

Boeing Valley Retirees Club meets on the 3rd Thursday of each month at the Canoga Park Rec Center, 8500 Fallbrook Avenue, Canoga Park, CA. The president is Jennie Muncaster at (818) 341-8919.

"The Old LAD Stress Group" meets for breakfast approximately every two months at Mimi's Café in Torrance, CA. If you are from the old LAD Stress Group contact Gene Laxton at (310) 378-3113 or Ed Rosenthal at (310) 375-8933.

"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meet at 11:30 AM on the 2nd Wednesday of the month for lunch at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd. and Mariposa Ave.

The NAA 101 Tooling Retirees Group meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at the Cimarron Café, 5160 190th St., west of Anza Avenue in Torrance, CA.

GPS Breakfast Club meets from 6:00 AM to 8:00 AM every Wednesday at the Primrose Restaurant, corner Seal Beach Blvd. and Westminster Blvd. All are invited. For more information, call Fred Shitara at (714) 750-1016.

Seal Beach Retirees Group meets at 11:30 AM on the 3rd Wednesday of the month at "The Fish Co." on Los Alamitos Blvd. at Katella Avenue. For more information call Marvin Blaski at (714) 848-5717 or e-mail to *mblaski@aol.com*.

The Facilities, Industrial Engineering and Plant Service Retirees Group meets at 11:45 AM on the 2nd Thursday of each month at Buster's (formerly Jolly Roger's) Restaurant in the Long Beach Marina. Contact Joe W. Mausser at (562) 596-5845.

Downey Engineering Group of Retirees known as the "Choir Boys" meets every Thursday for lunch at various restaurants from Downey to Seal Beach. Call Al Risi at (714) 892-5725 for meeting location.

"Ye Olde Pharts Breakfast Club" meets at 10:00 AM on the 4th Thursday each month for breakfast at Polly's Pies at 2025 N. Tustin Avenue in Orange. For information call Don Metzger at (949) 495-5374.

The North American Rockwell Retiree Club of McAlester, OK (a satellite of Tulsa, OK) meets at 10:30 AM on the 3rd Tuesday in March, June, September and December at the Down Town Meeting Place. Call J.A. Darden at (918) 423-0706 for more information.

Tulsa & McAlester Retirees meet for breakfast at 8:00 AM on the 2nd Monday in March, June, September and December at the Ramada Inn, 8181 East Skelly Drive in Tulsa, OK. Call Harly Phillips at (918) 838-3716.

The North American Rockwell Retirees Group of Columbus, OH Engineers and professionals meet at 11:30 AM on the 3rd Thursday of each month at the Berwick Park House. Contact Byron C. Solomides at (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH meets at Noon on the 1st Monday of the month at the Old Rockwell Park on North Hamilton Road. Contact E. Hamilton at (740) 927-5940 for information.

Autonetics Group including Marine Systems, Program Office, Project Office, System Test, Engineers and Designers meets for lunch on the last Wednesday of each month at the HomeTown Buffet, Rose Avenue and Alta Vista Drive in Placentia, CA. Call Mike Vohs at (714) 762-1925 for more details.

Autonetics Industrial Engineering and Maintenance Retirees meet for lunch on the 1st Thursday of each month at the HomeTown Buffet, 390 McKinley, located in front of the Home Depot, in Corona, CA. For more details, call Don Burt at (909) 698-0072.

Autonetics Flight Control Retirees meet at 11:30 AM on the 3rd Thursday of each month except December at "The Lamppost Pizza House" located at 17568 Yorba Linda Blvd., corner of Richfield Road, in Yorba Linda, CA. Call Jim Anderson at (714) 779-5620 for details.

Autonetics Retirees meet for lunch at 11:45 AM on the 2nd Wednesday of every month at the Rembrandt Restaurant, 909 E. Yorba Linda Blvd., Placentia,CA. All Autonetics retirees, spouses and friends are invited. Contact Robert Nease at (714) 971-7870 or e-mail to *rfnease@email.msn.com* or Ed Venanzi at (714) 779-5652 or e-mail to *EdVennz@aol.com*.

A Group of NAA Retirees meets for breakfast at 8:15 AM on the 1st Wednesday of each month at Knott's Berry Farm-Chicken Restaurant. All are cordially invited. Contact Maxine Haun at *maxi3131@aol.com*.

Autonetics Financial Luncheon Group meets for lunch at Noon on the last Wednesday of the month at Carrow's located at 100 N. State College in Fullerton. Contact Ken Cantwell at (714) 970-7171 or *Kcantwell@prodigy.net*.

A Group of Engineer Mgt. meets at 11:30 AM on the 3rd Tuesday of the month for lunch at Denny's on Imperial Hwy and the 57 Fwy. Call Ed Moran at (562) 697-9949 for information.

NAA Tech Reps Assn. (TRA) Breakfast Club meets at 9:00 AM on the 1st Tuesday of each month at the Carlsbad Airport Restaurant. For more information, call El Presidente Rafael Colunga at (760) 940-0525.

Material Group retirees from Downey and Seal Beach meet at 11:30 AM on the 4th Wednesday every month at the Stox restaurant at Imperial Hwy. and Clark Ave. in Downey. Contact Marian Nielson at (562) 429-1020 or Joan Dominguez at (562) 865-7200 or e-mail to *tatedom@aol.com* for location.

ANNUAL EVENTS

Bald Eagle Reunion – The 41st Annual Reunion will be held on Saturday, April 12, 2003 at the Proud Bird Restaurant. Call Val Yarbrough at (805) 646-2283.

Grants Pass Picnic – Held the 1st Wednesday after Labor Day, September 3, 2003 at Indian Mary Park in Grants Pass. Contact Bob Morse at (541) 474-1438 or e-mail to *lindabob@internetcds.com*.

Flying Horsemen – The annual reunion will be held Saturday through Monday, September 6th through 8th, 2003 at Bob and Linda Morse's home in Grants Pass, OR. Contact Bob or Linda Morse for reservations at (541) 474-1438 or e-mail to *lindabob@internetcds.com*.

The Hangar Gang – This group of retirees meets approximately every 6 months. For time, date and other details, call Gene Salvay at (818) 788-3974 or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

Annual Flight Test Instrumentation Reunion – This group of retirees meets annually at the Fullerton Elks Club. For information, call Frank Vigil at (562) 691-0236.

Tech Rep Association – A group of retired Field Service Technical Representatives has a yearly picnic in June at a park in Fallbrook. For more information, call TRA President Rafael Colunga at (760) 940-0525 or e-mail to *rafael@nctimes.net*.

The Annual M&P, P.D.L., "Friends Christmas Luncheon" – This group of retirees and employees have assembled in mid-December for a festive luncheon and gabfest for the past 19 years. Those wishing to participate and receive notice of the next December luncheon, call Fred Koeller at (310) 545-8854.

NAA-K B-25 Reunion – Will be held on Sunday, August 17, 2003 at 1:00 PM to 5 PM at the Wyandotte County Museum. For more information, call Harry J. Desko at (913) 287-7223 or write to him at 3024 N. 47th St., Kansas City, KS 66104.

To have your group or function listed in the CALENDAR OF EVENTS, please send the information to the NAA Retirees Bulletin including identification of the group, date(s) of the event, location including address and name of contact with phone number and e-mail. Send to NAA Retirees Bulletin, 2600 Westminster Blvd., P.O. Box 3644, M/C SJ51, Seal Beach, CA 90740.

NATIV – NAA ENTRANCE INTO THE SPACE AGE

by Jeff Schmidt

1947 was not a very good year for engineers seeking employment. I had been working as a carpenter when, in September, I received a telegram from North American Aviation offering me a job to work on a Long Range Navigation System for a guided missile program. I would be a research analyst making $234 per month. Although this was considerably less than I had been making as a carpenter, it was the first real engineering job offer I had received and I accepted the position.

I started working in October and found to my surprise that I would not be working on navigation. That same year, the USAF awarded NAA a contract to design and build a small test missile to obtain supersonic aerodynamic date. It was designated NATIV- for North American Test Instrument Vehicle – and I was assigned to the NATIV instrumentation group. I also learned that I was not getting a salary of $234 per month, but a per hour pay that equaled $234 if I punched in every day for a full eight hour day! I was given a Department 56 yellow badge. A week later I got an "A" decal on it which indicated that I was in Aerophysics and not into airplanes! A few weeks later, I received a Department 95 yellow badge.

The NATIV vehicle was 18" in diameter and 14 1/2 feet long. It had a fixed rocket motor using nitric acid and aniline. The fuel and oxidizer were forced into the combustion chamber by pressurizing their tanks from a gas bottle. Being hypergolic, no ignition system was required to produce ignition. Once the missile was fueled, it had to be launched within a few hours or the nitric acid would eat through the tank. Alternately, the acid could be drained if the launch was postponed. The NATIV was launched on a rail up a 182 foot tower, tilted at 14-18 degrees from vertical. As the vehicle exited the tower, four moveable fins made it aerodynamically stable. The trajectory was controlled by "tilting" the tower. A rudimentary autopilot provided roll control.

The NATIV instrumentation was made up of an SCR584 radar to track the missile using an onboard radar beacon, a telemetry system and several phototheodolites for optical tracking. The phototheodolites were made from WWII aircraft trackers which required two men to track a vehicle. One would track in azimuth and the other in elevation. As modified for the NATIV, a telescope with a camera attached would be pointed at the target. Each frame of the film would show the target and the related azimuth and elevation angles to the telescope crosshairs. The position of the target to the crosshairs made it possible to correct for tracking errors. Timing signals were included for each frame so that data from different theodolite stations could be combined to calculate the trajectory. These same signals were incorporated into the radar data.

When I arrived, work on the instrumentation system was already underway. Claude Chapman was the lead engineer for the radar and telemetry system and Mike May headed up the phototheodolite work. I was given the task of designing and building a communications system allowing everyone to talk to each other. Each phototheodolite station was to have a local intercom between the tracker and a small building containing the timing equipment. These stations could also talk to the rest of the network. The radar had a similar intercom station. Two master stations, one in our laboratory building and one in the blockhouse, could override anyone talking on the network or at a local site.

It soon became apparent that the instrumentation program was underfunded and behind schedule. I had a technician, Bob Graham, working for me that knew his way around the factory floor. We would go over there during the lunch break and use the engraving machine to engrave front panels. We also went through the scrap bins to find wire which we then numbered using their numbering machine. We engraved panels for most everything even the breadboards which may not be working yet. Next, we put knobs, switches and meters on the panel, sometimes held on with chewing gum. These were photographed and became part of a brochure to obtain more funding.

I guess it worked. In January 1948, we were sent to Holloman Air Force Base in Alamogordo, New Mexico to install the equipment for testing the NATIV missile. For this field assignment, we were paid $7 per diem. I was now making as much as I did when I was a carpenter. When we arrived, a group under Sid Goldberg was already on site. They were responsible for the actual NATIV missile and the wiring from an NAA blockhouse to the launch tower. They were the people that tilted the tower for the desired trajectory, fueled the vehicle and did other related tasks.

Shortly after we arrived, an extreme cold spell hit New Mexico. My technician, Bob Graham, was living in a trailer with his wife and baby. It was so cold that he had to run the exhaust from his car onto a butane tank to keep it warm enough to maintain the flow of the butane gas to the heater in his trailer. Those of us that were single, were living in a BOQ left over from WWII. We were fairly comfortable until the boiler blew up and we had no heat at all. With the pressures of attempting to meet unrealistic schedules and the deteriorating living conditions, we started to grumble. Our administrator, Ralph Oakley, called the plant and Dr. Edlefsen arrived the next day. He made some changes and sent Tom Moore to head up the effort.

Dr. Edlefsen began to take a personal interest in the NATIV program. He decided that a countdown was needed to coordinate all of the activities of the missile gang, the instrumentation guys and the USAF. Loran Sacket and I were given the assignment to interview all the participants and to compile all the



Photo Courtesy of the Boeing Historical Archives

The 14 1/2 foot long NAA NATIV being erected for launch at Holloman Air Force Base in Alamogordo, New Mexico during Summer 1948.

requirements into a countdown. Dr. Edlefsen sent his personal secretary, Marian Gillis, and we dictated the countdown to her.

The NATIV had several failures before it finally got to the launch tower. One morning everything was ready. The countdown was going well. The side of the missile instrumentation compartment was open for some final checks. NAA photographers were all over the tower taking pictures. Suddenly the tower and missile were drenched with thousands of gallons of water! The tower was equipped with a sprinkler system to wash down the rocket fuel if necessary. It appears, an airman had decided to test his pumps and did not close the proper valves. It was urgent to get the flight off! It was decided to dry things off and to proceed with the countdown. After drying off, everything seemed normal except the radar beacon. Besides being a beacon for the radar, the beacon was part of the destruct system. If the radar pulse repetition rate was changed, the beacon was supposed to send a signal to destroy the missile. After further drying, the beacon appeared to be acceptable. The missile was buttoned-up and fueled.

The countdown was in the final minutes when a jeep came roaring up to the blockhouse. Our weather man, whom we called Wheeler Dealer Dix, had been sending up balloons to check the wind. He rushed in shouting, "Stop the flight! The wind has changed. We are aimed at Tularosa!" It was too dangerous to change the tilt of the tower while the missile was fueled. Tom Moore, the head of NAA operations, said we must get the flight off and to continue the countdown. A quick calculation was made to determine how long the rocket could burn and still fall short of Tularosa. The missile was launched and, at the calculated number of seconds, the destruct signal was given. The radar beacon, which had just been dried off, worked as planned and the missile went down a safe distance short of town.

A new missile arrived from California. After some checking, it was determined that the wiring configuration had been changed from previous missiles. We had no idea why this was done and decided that it would be easier to change the missile wiring rather then the blockhouse and tower wiring. Everything went well and we completed the mod in three days. We were in the final countdown to launch. After the previous flight which was terminated short of Tularosa, Dr. Edlefsen said that he wanted to be informed before we launched anymore missiles. Tom Moore placed the call and Dr. Edlefsen's secretary informed Tom that he was in an important meeting and could not be disturbed. She said we would have to cancel the flight. For a long time we had the saying, "Marian said no!" After this, I never underestimated the power of a secretary.

When we finally had a flight at full thrust for the full burn period, the missile rolled as it went through Mach 1. A mod kit was sent from the factory for the next flight and this one was stable through Mach 1. The mod provided blunt trailing edges for the control surfaces. Since blunt trailing edges were used on later vehicles, I guess that the NATIV proved at least one bit of transonic aerodynamics. I do not know to what extent NATIV test data was used to understand supersonic aerodynamics. Later however, when I was assigned to the NAVAHO flight controls, the aerodynamicists seemed to have a good understanding of how the lift and drag coefficients changed with Mach number.

When we arrived at Holloman Air Force Base, one problem that might have never been found in the laboratory concerned the timing marks on the theodolite film. All the tests done at the factory showed the proper timing marks when the film was developed. This was also the case in tests at our laboratory in New Mexico. However, when the film from tests at our tracking stations was developed, the timing marks had disappeared. These marks on the film were made by pulses of light from miniature neon bulbs inside the camera. Investigation determined that the timing equipment at the downrange sites was providing the correct voltage pulses but the film was void of timing marks.

One day, while I was checking a camera in our laboratory darkroom, I could see the neon bulbs flashing and everything appeared in order. It was lunchtime and I turned off the timing pulse signal. When I returned, I turned on the pulse signal but there were no flashes from the neon bulbs. I held my wristwatch, with luminescent dial and hands, near the camera and the neon bulbs started flashing. It became evident that the level of ionized gas decayed with time in darkness. My watch provided enough ionization for the bulbs to flash. When a camera was loaded to support a test, the ionization level would drop during the time it took to drive to a downrange site.

One day, Bob Graham and I were going out to Tularosa Peak to do some work at our radar site. We stopped at a field phone mounted on a post to confirm that no one was firing a missile that day. The airman on duty assured us that nothing was scheduled and it was safe to proceed. As we were returning, Boeing fired a missile. The WWII boosters burned out and fell in front of us. The ramjet fell in back of us. There was a lot of desert out

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Photo Courtesy of the Boeing Historical Archives

The NAA NATIV missile launched at Holloman Air Force Base in 1948 by rail from a 182 foot tower which could be tilted 14-18 degrees from vertical.

Having The Best Jobs In The Company – Part II

by Albert (Al) Martin

In the Spring 2002 issue of the NAA Retirees Bulletin, I stated that my job as test engineer and pilot on the NAVAHO program was one of the best jobs in the company. In the mid-1950s, the NAVAHO test program moved from EAFB in California to the Cape Canaveral Air Force Station (CCAFS) in Florida. That location provided access to the Eastern Test Range with radar and flight control equipment on several islands. I moved with the program and continued to have one of the best jobs in the company.

The NAVAHO had three configurations: X-10, G-26 and G-38. The X-10 and G-26 were test vehicles for the operational G-38 capable of delivering an atomic weapon intercontinental distances. Although several X-10s and G-26s were flown, the program was cancelled before the G-38 assembly was completed. All three were canard configurations with delta wings and twin engines. The X-10 was powered by two turbojets and took off and landed conventionally with a tricycle landing gear. The G-26 and G-38 were powered by two ramjets and were boosted to 70,000 feet by a twin chambered rocket. The G-26 had a landing gear to initiate recovery. Design speeds were Mach 2.0, 2.75 and 3.25 respectively.

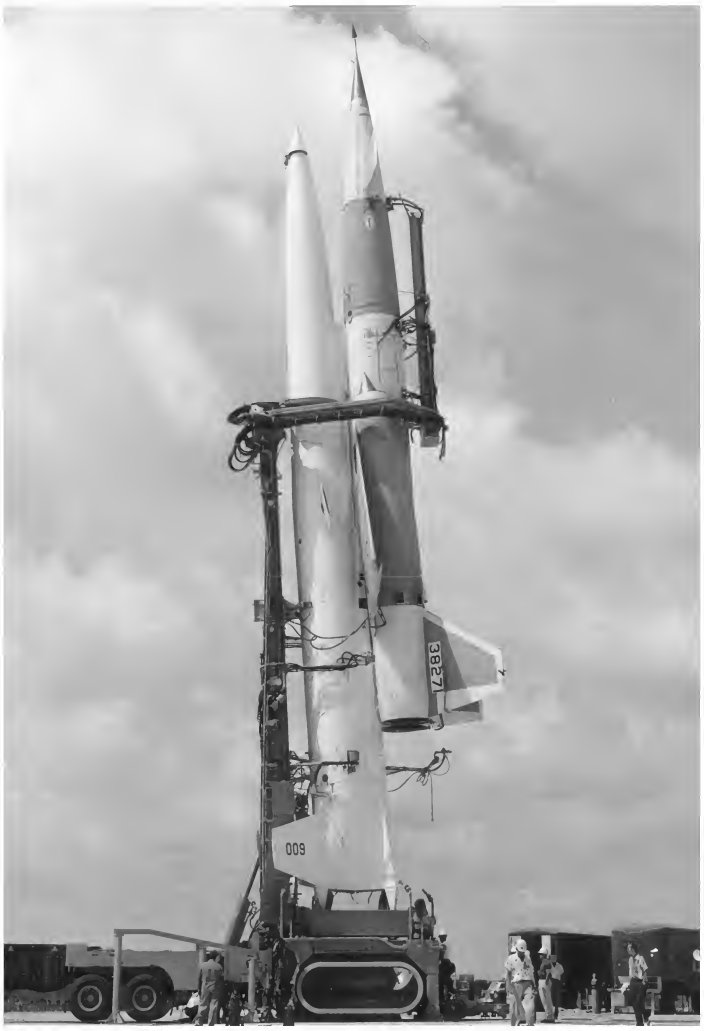


Photo Courtesy of the Boeing Historical Archives

View of erect NAVAHO G-26 Missile No. 4 on Booster No. 9 on a mobile launcher with the mobile erecting arm locked around the body with fuel and electric lines running to several umbilicals.

My job was test conductor on the G-26. But, first, a few words about our new environment in Florida. The test team was formed at the Downey facility and transferred to Florida. Orion Reed was base manager with other key members of management including Ray Pyle, Engineering; Lyle Bjorn, Operations; Jessie Bowman, Autonavigator; Jim Thompson, Instrumentation: Gary Owens, Autopilot: and Norm Clair, Shop. Among the pilots we had Jay Deming, Joe Murphy, Wendell Garton, Jack Nunnally and Eustis Hetzel.

There were very few local hires due to the scarcity of technically experienced people. We were not only pioneers in our technical field but we were pioneers in basic living. The company had to offer "swamp" pay to entice employees to move there. There were no houses available until a developer built a tract of homes in Cocoa Beach and sold them to us at a reasonable price. Almost everyone in our neighborhood was a coworker at North American Aviation. There was only one small grocery store and we had to drive 60 miles to Orlando to purchase clothes or we ordered them from the Sears catalog. There was one motel in Cocoa Beach and the nearest hotel, the Tradewinds, was thirty miles south of Cocoa Beach. The State Bird was the Mosquito!

On the plus side, the beach was isolated and beautiful. Advertised as the "Trout Capitol of the World"; if you didn't catch 15 to 20, you had a bad day! An interesting phenomenon developed: after six months the newcomers from California either hated it or loved it. Those that hated it returned to California, those that loved it remained. Like myself, some are still here to this day!

The X-10 made 15 successful flights in the California desert and, now, it had to perform in a high humidity climate, fly over water, simulate the high angle of attack and steep approach of the G-26, and land on a narrow runway with no overrun provisions.

Prior to initiation of G-26 testing, the X-10 testing got underway with the first flight in August 1955 and the final flight in November 1956. The X-10 made twelve flights from CCAFS, using six vehicles. As in California, flight control was a combination of automation, control from a chase plane or from a ground station that was located in the flight control building offset from the center of the runway. Flight control equipment was also located on the USAF Eastern Test Range islands. The primary test objectives were to test high-speed flight stability, automatic approach and landing, inertial navigation and the dive-in attack mode.

The X-10 took off and landed on the CCAFS runway known as the "skid strip". The automatic landing system controlled the approach path vertically, flare and touchdown. Horizontal direction control was manual, using a device called the "heroscope". It was appropriately named because it was located on the centerline a VERY SHORT DISTANCE beyond the far end of the runway. The operator aimed the scope at the vehicle as it came towards him and the device generated radio commands to correct deviations from the centerline. The X-10 had a parabrake for deceleration and, in addition, a barrier chain was stretched across the runway, 2,500 feet from the end.

The X-10 testing got off to a spectacular start on the first flight. The automatic approach and landing system worked fine but the parabrake failed to deploy and the barrier chain malfunctioned. The vehicle ran off the end of the runway into

the soft sand, crashed and burned. The heroscope operator, Ernie Martin (no relation) had the best view. On the second flight, a ground control approach was used. This was an interesting operation wherein the ground control pilot used lines applied to the flight control building windows as a visual reference. The landing was successful but due to failure of a shimmy damper, the vehicle ran off the runway, crashed and burned. Once again, Ernie had the best view. On the third flight, the parabrake did not deploy fully and the barrier chain worked partially causing minor damage to the vehicle. And again, Ernie had the best view. I did not consider Ernie's job one of the best in the company! However, things got better with later flights and the X-10 met all test objectives.

There were three G-26 test conductors: Bill Bigelow, Lou Jared and myself. We were assigned a vehicle at the factory in Downey and managed it through checkout and launch in Florida. When I was not assigned a vehicle, I went to one of the downrange islands and served as ground control co-pilot. The G-26 was a ramjet powered vehicle that was boosted to 70,000 feet altitude by a twin rocket motor booster with a total thrust was 240,000 pounds. The boosters were static fired separately and then with the ramjet vehicle in a piggyback configuration.

The prototype booster arrived in late 1955 and four successful static firings were completed in December 1955 and January 1956. The first flight-ready booster arrived in late March 1956 and the first missile in early April. I was assigned to manage this first flow. Significant problems with both the booster and the missile delayed the flight until November 1956. During the pre-chilling of the liquid oxygen tank for the first static firing, the fiberglass insulation separated from the aluminum tank wall. A rather ingenious design was quickly developed: bed springs were wrapped around the tank to retain the insulation. The final fix was to change the primer to provide better adhesion.

Several technical issues with the booster caused the static firing to be repeated. One example was an inadvertent disconnect of an electrical umbilical which required Pat Ciaccio and Chuck Hannon to go to the launch pad to reconnect it with full propellants on board. That was not one of our best jobs! Another occurrence involved the liquid oxygen vent valve which froze closed with pressure building up in the tank. Obviously, our concern grew with the possibility of the tank rupturing with a full load of propellants in both vehicles. I was the overall conductor in the blockhouse, Bob Weaver was the missile test conductor and Chuck Stevens was running the booster countdown. Air Force personnel monitoring our operation sent for a sharpshooter to shoot a hole in our booster to relieve the pressure. We thought that would blow it up for sure! We contacted the valve designer, Sid Glasser, in Downey and he recommended waiting and the valve would open when the pressure got higher. We talked the Air Force out of shooting our booster and the valve eventually opened.

Another exciting static firing occurred when the rocket engines failed to shut down when Chuck Stevens called for cutoff. The technician pressed the cutoff button but nothing happened. The test was scheduled for thirty seconds and the time was being exceeded. The structures designers told us that with a full load of fuel in the missile and no fuel in the booster, the unbalanced load would cause the vehicle to topple over! Much to my relief, the rocket motors shutdown shortly after thirty seconds. It turned out that the electrical umbilical was vibrating resulting in the connection to make and break. Fortunately, the technician continued to press the cutoff button until the signal got through.

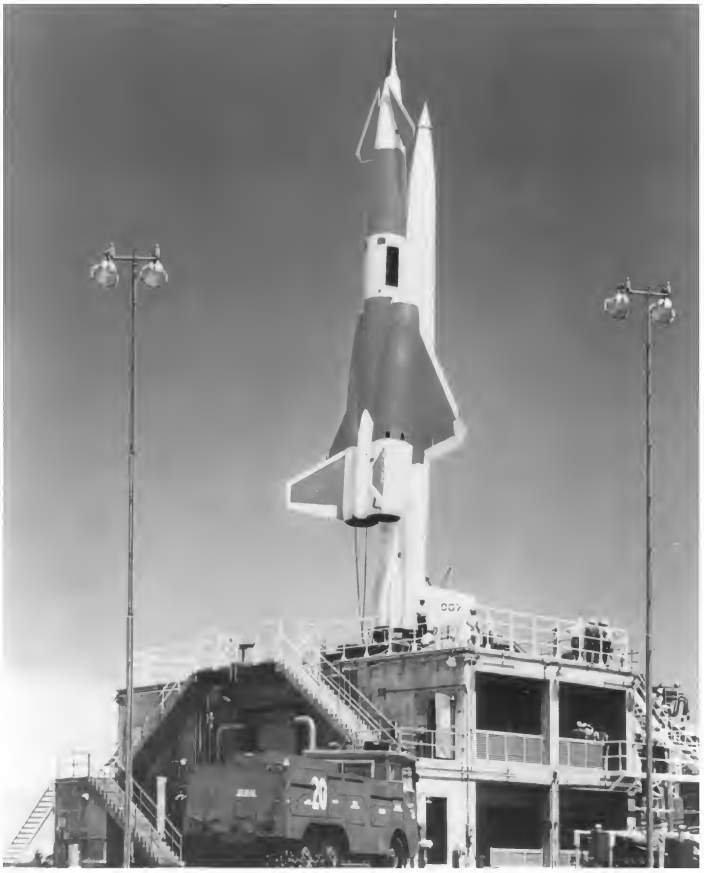


Photo from the Ed Rusinek Collection

The orange and white NAVAHO G-26 Missile No. 5 and Booster No. 7 atop the Cape Canaveral launch pad with the erector tower lowered in final preparation for launch.

One of the major technical problems we had during this period involved the auxiliary power unit (APU). Since the ramjet had no moving parts, an APU was required to provide electrical and hydraulic power. The unit was powered by a hydrazine gas turbine with a gas generator. The primary problem was to get the gas generator started because it had a glow plug that was temperamental. Our APU engineer, Tom Carlyle, discovered that it would start by tapping it with a piece of 2"x4" wood. The inspection supervisor, Cecil Knowles, questioned the authorization for the use of the 2"x4", so we assigned a ground support equipment (GSE) number to it and got it stamped off by inspection. Needless to say that approach did not last long and the gas generator was redesigned.

In November 1956, seven months after the arrival of the missile and booster, we finally were ready to launch. The purpose of the flight was to obtain data on booster operation, missile flight control, vibration and flutter. The liftoff was normal; but after ten seconds, the vehicle began to oscillate in pitch. After twenty-six seconds, structural failure occurred and large sections broke away and landed a few miles off shore. Data analysis indicated that the pitch rate gyro was installed incorrectly.

Bill Bigelow served as the test conductor for the second flight using Missile No. 4, including an autonavigator, and Booster No. 9. Ten attempts were made to launch between December 1956 and February 1957. Numerous problems including missile technical difficulties, booster technical problems, weather, ships in the danger zone and power failure at one of the downrange islands caused

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Having The Best Jobs In The Company

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persistent delays. On the tenth attempt, a valve in the booster ignition system failed. A decision was made to remove the vehicle from the launch pad to correct the problem.

By this time, my next missile, G-26 No. 2 and Booster No. 6 were ready to go. Missile No. 2 did not have an autonavigator so its mission was the same as No. 1. Rocket engine start and lift-off were normal. However, the fuel start pod failed to eject at lift-off due to a lanyard malfunction. Aerodynamic forces on the pod caused a structural failure and thrust was lost at 15,000 feet. Separation occurred at 28,000 feet but the speed was too low to ignite the ramjets. The missile was controllable from the ground and it glided to impact a few miles from shore. The press reported a successful flight with a beautiful dive-in!

Missile No. 4 was still not ready; so in March, Missile No. 5 and Booster No. 7 were placed on the launch pad with Lou Jared the test conductor. The static firing was completed on the fifth attempt in late March. Launch was on April 25, 1957. Engine ignition was normal and the vehicle lifted off the pad. When the vehicle reached about four feet in altitude, both rocket engines shut down and the vehicle fell back on the pad and exploded. The vehicle was totally destroyed and the pad was severely damaged. Earlier, during one of the static firings, we could not shut down the engines due to umbilical vibrations. A modification was made which included a lanyard that required breakaway in a correct sequence. I believe the engineering was correct but the lanyard was fabricated too long. As expected, this incident triggered a series of in-house and Air Force reviews and several recommendations were made and incorporated to improve reliability.

By June 1957, the launch pad had been repaired and Missile No. 3 and Booster No. 8 were placed on the pad. The test objectives were to test aerodynamics during boost, separation, cruise and landing. New measurements were added to obtain data on the ramjet system. Instrumentation on the NAVAHO was very limited and the recent reviews recommended additions. The lift-off in late June was normal but a malfunction in the rocket engine caused loss of thrust at 42 seconds into the flight. The vehicle coasted up to 40,000 feet and separation occurred. The missile was too low and too slow for the ramjets to ignite. Ground Control took over and glide data was obtained. We now had four flights and none of them boosted the missile to the ramjet ignition environment of 70,000 feet and Mach 3. A few days later, on July 13, 1957, the program was cancelled. This date became known as Black Friday. It was estimated that 15,000 people were laid off.

Even though the program was cancelled, we would continue to fly seven more flights to gather data to be used in future supersonic designs. The last flight took place in November 1958. These flights were hindered by failures, however, a significant amount of data was obtained. The longest flight extended to Puerto Rico, a distance of 1,000 miles. I continued to rotate between serving as test conductor and ground control co-pilot at several downrange islands including Grand Bahamas, Eluthra and St. Lucia.

In summary, given the number of failures, how could I consider this assignment one of the best jobs in the company? First, I believed that what we were doing was important. At the time the NAVAHO was conceived, the ballistic missiles could not deliver a nuclear warhead the size and weight that the NAVAHO could. We would have eventually solved the technical problems. However, the development of smaller, lighter hydrogen bombs made delivery with intercontinental missiles feasible, negated the need for the NAVAHO.



Photo Courtesy of the Boeing Historical Archives

The launch of NAVAHO G-26 Missile No. 2 from the Cape Canaveral Launch Complex ended with the loss of thrust at 15,000 feet and separation from the booster at 28,000 feet.

Also, I was aware that we were pioneers in the development of many systems that would be used in later applications. Examples are many, including rocket engines, autonavigators, telemetry, autopilots, radar and titanium structures. These technical achievements have been well documented.

Other reasons were personal. I had a good analytical background and what better way could a young engineer round out his education than being responsible for managing the flow of a highly technical vehicle from the time it left the factory through launch. The failures were disheartening but each one was a learning experience. This experience would prove to be very valuable with later assignments on the Apollo and Space Shuttle programs.



About the author: Al returned to Downey in 1960 as the Saturn S-II Director of Test Operations and, in 1965, went back to Florida as Director, S-II Launch Operations. At the conclusion of the Apollo program, he again returned to Downey as the Chief Engineer, Shuttle Systems Integration and as Chief Engineer, Orbiter DDT&E. His final move to Florida came in 1982 where he retired in 1990 as Vice President, Florida Operations. Al currently resides with his wife, Glennadora, in Cocoa Beach, FL.

A STENO IN THE OLD LAD STRESS GROUP

by Jeanette Orgill

In ancient times, over fifty years ago, I passed a test and got a job at NAA as a stenographer. I suspect I passed because I could spell. Not having any idea what the job entailed, imagine how intimidated I was when I found myself in the Stress Group facing a hundred and fifty young men (no women) lined up, row upon row, at full sized desks in a huge room!

Mr. Schleicher was the big boss who had his own secretary. Cecil Davis had the Structures Group and Harvey Hoge was in charge of Loads. Later, I worked for Cecil and Betty Pritel was assigned to Harvey. Mostly, we answered the phones. Ethically, in those days it was considered unprofessional to make a lot of personal calls while on the job.

The typing consisted of rows and rows of figures, the results of stress tests and calculations first done by hand and then turned over to us for typing. Practically every engineer had a calculator (a big one) on his desk and he would grind out the numbers. I remember a few of the names—Alpha Dowdy, Ed Dickerson, Ken Kleinwachter and Ed Rosenthal. I found that most of these young men were serious workers, intent on seeing that their airplanes were the best they could analyze. I even got a chance to see them drop a fighter plane in the Stress Lab—lots of sparks and noise.

Once in a while, I would get to take a letter and type it, usually from Howard Arvin or Frank Wagner, who were considered specialists. It so happened that I typed the letter for Frank urging NAA to get a Defense Calculator, later known as the 701. When they did order one and it became apparent that Frank was going to form a new group, I asked to be taken on as a secretary. I had to get a release from Cecil Davis. He tried to discourage me, saying something to the effect that these computers were a fad and the job might vanish at any time!

Frank Wagner was an innovator in more ways than one. He hired *women in salaried positions.* One of the first was Florence Anderson, who taught a whole generation of engineers how to use computers. Then, he hired Al Farnell, who had his doctorate in *mathematics* instead of engineering.

Frank, Florence and Al found they had a hobby in common, and taught me how to play bridge in order to have a fourth. We had only a 42-minute lunch hour. The "dummy" shuffled and dealt the cards for the next hand while the others played. When I first tried to play "party" bridge, I couldn't believe the amount of time they spent shuffling the cards while everyone else waited.

I persisted in the Engineering Computing Group and spent the next twenty years associated with computers. It started with a big closet to hold all their programs on punched cards, shelves full of flat long boxes. The desk calculators gradually disappeared. Then came the Computing Lab, where the punched cards were fed to tapes, which fed more efficiently into the main frame. When I left in 1973, the desk computer was just coming into use.

About the author: Jeanette resides in Apache Junction, AZ.

FACTS ABOUT THE IBM ELECTRONIC DATA PROCESSING MACHINES — TYPE 701

A Stored Program, Parallel, Binary Computer

★ **Electrostatic Storage Capacity—** 20,480 digits

★ **Magnetic Drum Capacity—** 81,920 digits

★ **Magnetic Tape Capacity—** over 8,000,000 digits, without changing tapes

★ **Addition and Subtraction—** over 16,000 operations per second

★ **Multiplication and Division—** over 2,000 operations per second



★ **Tape Reading and Writing Speed—** 12,500 digits per second

★ **Drum Reading and Writing Speed—** 8,000 digits per second

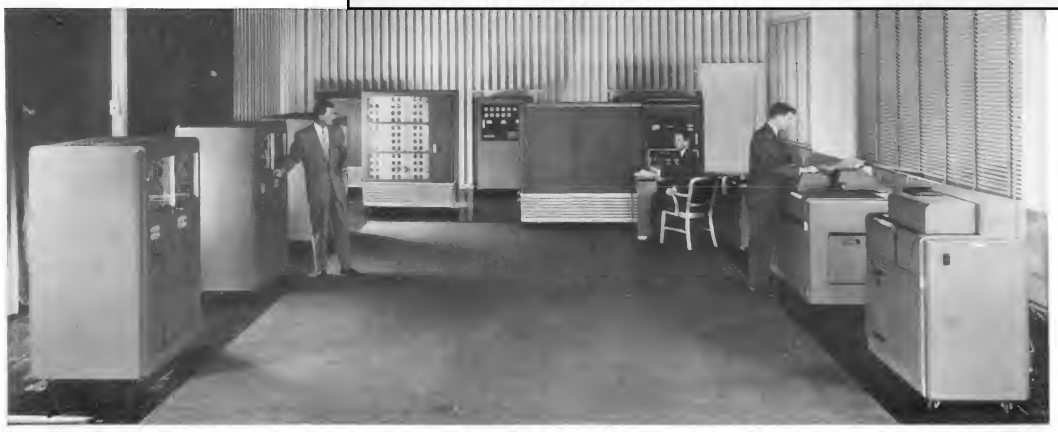
★ **Printed Output—** 180 letters or numbers per second

★ **Punched Card Input—** 600 digits per second

★ **Punched Card Output—** 400 digits per second

- - - - *All data given in maximum equivalent decimal values* - - - -

Form No. 52-6005-0-50-3-53 Printed in U.S.A.



IBM ELECTRONIC DATA PROCESSING MACHINES—TYPE 701

The first NAA computer - The Electronic Data Processing System IBM Type 701

THE NAA F-86C/YF-93 PENETRATION FIGHTER

by Larry Davis

In 1946, the Air Force had recognized that all the current jet fighter designs were lacking in one critical area—range. The P-86A with 200 gallon ferry tanks under the wings, had a ferry range of 1,052 miles. The two other major jet fighter types, the P-80 and P-84, had similar limitations. Inflight refueling was still a glimmer in the eyes of the engineers. And, Strategic Air Command wanted jet fighters to escort their long range bombers to targets, which were now envisioned to be deep in the Soviet Union—and far outside the range of any jet fighter. They were known as "penetration fighters".

In late 1947, with the penetration fighter requirements in mind, NAA engineers started a project to both increase the range and the speed of their swept wing fighter. Any increase in range required an increase in fuel capacity, either in bigger internal tanks or through droppable underwing fuel tanks. The engineers enlarged the entire fuselage in length, width and depth. In addition, the wing span was increased 1'-8" on each wingtip.

Both of these changes increased the internal fuel capacity from 435 gal. in the F-86A to an incredible 1,561 gal. internally! And since the new penetration fighter used a modified F-86A wing; it was able to carry any of the underwing tank designs available, including the 200 gal. ferry tanks. That brought the total to 1,961 gal. The range, without refueling, was estimated to be in excess of 2,000 miles.

All of this extra fuel meant the airplane gross weight was increased a corresponding amount; from 15,876 lbs combat weight in the F-86A, to 26,516 lbs in the F-86C. The J47 engine did not have enough power to keep the much heavier fighter in the transonic speed range necessary for jet combat. Pratt & Whitney had an engine available, the J48-P-6 engine which had an afterburner. The J48 was rated at 6,250 lbs static thrust, with 8,750 lbs thrust available in afterburner

The NAA engineers decided to incorporate other new features which were just becoming available, such as the SCR-720 search radar and six 20 mm cannons in place of the standard .50 caliber armament. The heavier weight necessitated a dual wheel main landing gear. With the radar mounted in the nose where the air intake was located on the F-86A, the engineers designed a novel set of flushmounted, NACA designed, air intakes on each side of the forward fuselage. The center of the fuselage was slightly concave, giving the aircraft a distinctive "wasp waist" appearance.

Other segments of the new penetration fighter retained their F-86A ancestry - the canopy/windscreen design, both vertical and horizontal tail designs, cockpit and ejector seat, nose gear assembly, and the main portion of the wing. With all that hardware identified as common to the F-86A, it was natural that the aircraft be designate din the F-86 family. However, the Air Force decided that there were too many design changes in the penetration fighter design, and redesignated the airplane as the F-93.

In December 1947, the Air Force ordered two prototypes of the new fighter. Six months later, the Air Force added 118 more aircraft to the contract—18 months prior to the first airplane coming off the assembly line! In February 1949, however, the Air Force suddenly cancelled the entire project. The reasons were two-fold. The first, the successful development of the Boeing B-47 Stratojet bomber which was projected to be so fast it would not need a fighter escort. Secondly, was the drastic reduction in the overall defense budget.

North American Aviation already had the two prototypes under production and opted to go ahead and complete the two, now designated the YF-93. The first aircraft, Serial No. 48-317, made its first flight on 25 January 1950 with George Welch at the controls. The second, Serial No. 48-318, followed shortly thereafter.

In the late summer of 1950, the Air Force held a fly off between three "penetration fighter" designs-the McDonnell XF-88 Voodoo, the Lockheed XF-90 and the YF-93. The USAF Evaluation Board declared the XF-88 as the winner of the fly off. However, the rapid development of the B-47 and the even more formidable XB-52, made the decision null and void. There simply was no need for a penetration fighter aircraft.

The Air Force took control of the two YF-93As and obtained the following results from subsequent flight tests. The YF-93A's top speed was 708 mph at Sea Level, and 622 mph at 35,000 feet. The range was almost as predicted, 1,967 miles. Rate of climb with the J48 in afterburner was 11,960 feet/minute. Very impressive for an aircraft that would never be put into

The NAA F-86C/YF-93 Penetration Fighter
(continued on page 12)



Photo Courtesy of the Boeing Historical Archives

The YF-93A, NA-157, 48-317, originally designated as the F-86C, with flush engine air intakes. The plane was 50% heavier and had 50% more power.



Photo Courtesy of the Boeing Historical Archives

The YF-93A, NA-157, 48-317, with modified rounded engine air intakes after it was transferred to the NASA Ames Laboratory for further flight testing.

THE F-108 RAPIER – A TRIPLE-SONIC INTERCEPTOR

by Erik Simonsen

During the early 1950s, as strategic planners at North American Aviation were surveying requirements for the next decade, two significant advanced concepts began to emerge. One was a Mach 3+ intercontinental bomber, later designated the XB-70 *Valkyrie*; the other a long range Mach 3+ interceptor that could protect the entire North American continent from nuclear armed intruders.

In November 1955, the Air Force awarded study contracts to NAA, Lockheed and Northrop after completion of a Phase I advanced interceptor competition, initiated in September of that year.

NAA was awarded the development contract on June 1, 1957, for what was officially known as Weapons System 202A. Designated the F-108, a full scale mockup was completed and on January 20, 1959 it was presented to the Air Force. Later named the *Rapier* in May 1959, and slightly preceding the development of the XB-70, the Department of Defense and NAA considered the F-108 *Rapier* a significant technological leap forward.

Ambitious as the project the project was, NAA felt the development of the advanced interceptor was well within its capabilities. With unmatched mass production credentials, NAA had developed the first operational supersonic fighter, the F-100, and was concurrently developing the Mach 2 A3J *Vigilante* (later RA-5C) for the Navy.

As a cost-saving measure, while developing the F-108, NAA instituted a program of shared technologies with the proposed XB-70. The interceptor would incorporate the same basic 30,000 pound thrust YJ-93 engine, honeycomb stainless steel materials and clamshell escape systems as the XB-70. The F-108 could also be utilized as an escort for the B-70.

Operating at Mach 3 at 75,000 feet, with zoom climb capability to 100,000 feet, the Rapier would have provided U.S. air defenses an effective look-down shoot-down capability, intercepting potential nuclear-armed adversaries well away from U.S. borders.

While air defense was considered high priority within some circles, U.S. defense budgets began to flow in favor of Intercontinental Ballistic Missile, or ICBM, development.

As a result, NAA's fighter legacy would come to an end on September 23, 1959, with a statement from the Air Force announcing that the F-108 program was being cancelled. This decision resulted in a domino effect by immediately negating the shared technology program and dramatically increasing the cost of the embryonic XB-70—a factor leading up to its eventual cancellation.



Photo Illustration by Erik Simonsen

The two-man crew, twin-engine F-108 was 89 feet in length with a span of 56.1 feet and a gross weight of 102,533 pounds

No Rapiers would be built, and its advanced AN/ASG-18 radar system and funding soon would be transferred to the classified Lockheed YF-12A/2B. Yet surprisingly, the promised F-12B Mach 3+ also was cancelled in 1968, twice leaving the U. S. without a high-technology air defense fighter.

The U.S. strategy of nuclear ICBM parity with the Soviet Union was reflected in the eventual selection of the F-106 Delta Dart as the nation's top air defense fighter. Though an excellent aircraft, its Mach 2.3 supersonic performance in afterburner was limited to about 12 minutes. The rationale for having a Mach 3+ interceptor fighter was to quickly meet threatening nuclear armed bombers, keeping any fallout from jettisoned ordnance or premature detonations far from the United States. The F-108 would have intercepted targets 1,000 miles from its base.

Fortunately, during the Cold War, the Soviet bomber force did not evolve into an overwhelming threat—the delayed supersonic Tupolev Tu-160 Blackjack only achieved limited production.

Ironically, with today's homeland security concerns, a follow-up quick response Mach 3+ interceptor would be a potent addition to U.S. defense forces, but the technology was not fielded.



Photo from the Erik Simonsen Collection

A full-scale F-108 Rapier mockup on display at the North American Aviation LAD facility.

About the author: Erik is currently the communications manager for Boeing Air Force Systems, which handles communications efforts for all Integrated Defense Systems programs with the U.S. Air Force. He is also a member of the Boeing History Council tasked with a charter to preserve the history of the Heritage Boeing companies. An avid aviation photographer for the past 30 years, he specializes in creative photographic techniques to illustrate aircraft and spacecraft. His photographs have appeared in numerous books, publications and advertisements as well as in two aviation books he authored. He originally joined Rockwell International in 1981, working communications efforts for NASA and military programs, joining Boeing with the acquisition in 1996.

NATIV – NAA Entrance Into The Space Age
(continued from page 5)

there and we were not close to either, but it did show that safety procedures lacked a certain discipline.

By late summer of 1948, the NATIV program was winding down. Many people opted to stay in New Mexico on other programs. Ray Curci would come to HAFB to work on the autopilot. He arranged a job for me back in California in the servo unit of John Moore's electromechanical group. After so much time in flight control, I was finally going to work in navigation.

I don't know what value the NATIV program had in the overall scheme of things, but I learned three axioms from this experience:

- Treat employees fairly and with respect
- There is no substitute for field testing
- Never underestimate the power of a secretary

About the author: After his stint in New Mexico, Jeff joined the electromechanical group in Downey where he worked on flight controls for the Navaho. In developing a control system for the first "boot strap" rockets, he programmed the REAC analog computer to simulate a start-up sequence. He was project engineer for the N6 autonavigators used on the X-10 and G-26. After the Navaho cancellation, he was the project engineer for the Hound Dog N5G. Moving to Autonetics, he was appointed chief engineer of the navigation systems projects including the SINS navigator for the USN submarine fleet and the inertial platform for the Minuteman missile. Subsequent advancements followed and he was the Vice President of Engineering for all of Autonetics when he retired in 1980. Today, he resides on a ranch near King City, CA with his charming wife, Jean.

The NAA F-86C/YF-93 Penetration Fighter
(continued from page 10)

production! When the Air Force was done, the two prototypes were transferred to the NACA Ames Laboratory at Moffett Field for further testing and evaluation.

NACA fitted the second YF-93A with standard intakes over the original flush mounted units. It was found that the conventional air intakes improved performance and the first YF-93A was subsequently equipped with a set. Both aircraft completed their service careers flying as chase aircraft for the newly developed Century Series of fighters that would replace the entire F-86 series. Both aircraft were removed from service in the late 1950s and scrapped.

About the author: Author of numerous aviation books, Larry Davis is currently the editor of Sabre Jet Classics magazine which is published by the F-86 Sabre Pilots Association. Larry resides in Canton, OH.

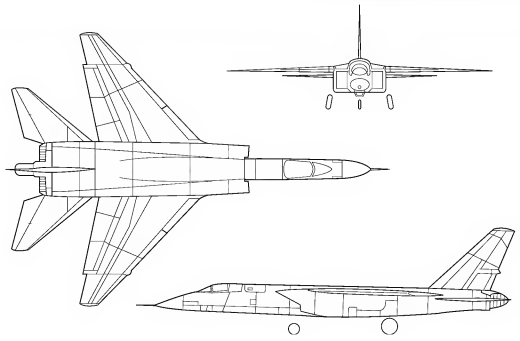
"Vigilante" Memorial At Sanford, Florida Firmed Up For May 30, 2003

In the Summer 2002 Retiree News, we alerted our readers to a significant undertaking by the city of Sanford, Florida that will feature a fully restored North American Aviation RA-5C *VIGILANTE* as the centerpiece of a Memorial Park honoring the former NAS Sanford—home of the *VIGILANTE*. The Memorial will be dedicated by Navy dignitaries at 10:00 AM on May 30, 2003. Those interested in attending the dedication and a large *VIGILANTE* Reunion of Navy and industry people, scheduled the evening of May 30, 2003, should contact Mr. Chuck Templin in Sanford at (407) 322-0380.

In addition, the city has decided to include an NAS Sanford Graphic Display Center in the main concourse of the adjoining Orlando-Sanford International Airport. This display will be a unique national treasure that will chronicle the evolution of Naval Aviation and will again centerpiece the *VIGILANTE*. The Memorial Committee needs additional funding to complete this display and is making a special request for donations in any amount sent to the Sanford Airport Memorial Committee, "Concourse Display", One Red Cleveland Blvd., Suite 1200, Sanford, Florida 32773.



Boeing Historical Photo



CONGRATULATIONS and MUCH HAPPINESS to

Shannon and Margaret Mercer of Lancaster, CA on their 60th Wedding Anniversary

The Silent Majority

by Stan Guzy



FELTZ, CHARLES H., 86 - died January 3, 2003 of congestive heart failure at Rancho Springs Medical Center in Murrieta, CA. Mr. Feltz had lived in Temecula, CA after retiring from NAA/RI with 45 years of service in various engineering positions. Mr. Feltz headed a top design team to develop the rocket powered X-15 aircraft, the first manned craft to probe the edge of space. In 1961, he was one of four leaders of NAA's Apollo spacecraft development team. He was president of Space Shuttle orbiter program when he retired in 1981. During his career he was involved in many aircraft projects, including the P-51 and B-25. He was a member of the NAA Bald Eagles. He served on the Presidential Commission investigating the Space Shuttle Challenger disaster. He was a dedicated, innovative, brilliant engineer. His accomplishments will remain his legacy. He is survived by his loving wife of 61 years, Juanita.

ADAMS, JOHN Q., 78 - died December 13, 2002 at the Shawn Manor Nursing Home in Ponca City, OK of undisclosed causes. He joined NAA/RI in 1954 as a policies and procedures expert working on the Apollo program. He left the company in 1986 to join LAUSD until he retired in 1984. Quincy was remembered as a very gentle man who is survived by his wife of 56 years, Phyllis.

ALBAUGH, ESTELLE C., 89 - died on November 11, 2002 of undisclosed causes. Estelle began her career with NAA in 1939. She was a co-founder of the Recreation/Welfare Department as part of North American Aid. During WWII, this included around the clock activities for employees and assistance to their families. As an employee counselor, her services extended to employees, families and retirees both on and off the job. She made daily hospital and home visits to ill employees and processed death claims. She assisted the American Red Cross in developing a company sponsored blood bank program which is still on-going. Estelle served on many social service boards as well as the board of the NAA Federal Credit Union for 40 years. She was on the board of directors for the Bald Eagles since its incorporation.

BARNER, ROBERT F., 80 - passed away peacefully at his home in Sparks, NV on December 13, 2002. He joined NAA in 1947 as a flight inspector. He subsequently worked at Palmdale and the Propulsion Test Lab at Santa Susana, CA. He retired in 1979 as a quality control supervisor at Edwards AFB testing Apollo First Stage F-1 rocket engines. He is survived by his loving wife, Evelyn.

BARTFIELD, JAMES E. "ED", 83 - died on December 12, 2002. Ed worked at the Columbus Division as a designer on the RA-5C aircraft.

BATCHLOR, THELMA, - passed away in October 2002 from undisclosed causes in Davis, CA. She had worked at the Rocketdyne Division for approximately 30 years.

BESICH, BERNARD "BERNIE", 74 - passed away on August 11, 2002 in Cerritos, CA of undisclosed causes. Information provided by his daughter, Jean Sleyko.

BISHOP, ARNOLD S., 95 - died November 24, 2002 in Orange, CA. He had been a design engineer for NAA/RI.

BOWMAN, DEAN O., 93 - died December 24, 2002 of natural causes in Pomona CA. Dean had worked as a vice-president of management systems and planning at Autonetics and was also the former dean of the School of Business Administration at CSULB.

BROWN, JANET K., 76 - of Thousand Oaks, CA passed away on July 19, 2002 at the Monterey Palms Healthcare Center in Palm Springs, CA from lung cancer. Janet began her career at NAA in 1947 as a draftsman when women working "on the board" were a distinct rarity. She had worked at Atomics International, and on the Apollo and B-1 projects. She retired in 1982 after 35 years of service. We were informed by her nephew, Paul Bereznay.

BURRETT, MELVIN C., 90 - died of cancer on October 11, 2002 in Sun City West, AZ. He had been a design engineer at Autonetics and did much work on the heads up display and crewmen optical sight. All of the photos and mementos of his career were lost during a fire. His wife, Ellie, would appreciate hearing from his colleagues who may have retained anything related to Melvin's work. She can be reached at (623) 546-9611 (we corrected the phone number).

CALKINS, EDWARD, - passed away on December 16, 2002 after a long illness. He joined NAA/RI in 1954 and held a number of managerial positions in human resources. In August of 1975 he was appointed as a director of human resources which he held until his retirement in 1987. Information sent in by John Eichwald.

CALL, FRANCIS E., 86 - died December 7, 2002 of natural causes. He was living in Westminster, CA and had retired from NAA/RI as a contract engineer.

COULSON, HARRY, 80 - passed away on January 5, 2003 in Arlington, TX following complications from lung surgery. Harry had 38 years of service at LAD and Space Division when he retired in 1978. He is survived by his wife, Jean, in Paso Robles, CA.

COURTNEY, THOMAS JR., 83 - of Santa Ana, CA , died on November 13, 2002 of pneumonia. He was an engineer at NAA/RI.

CRUMP, JOSEPH L., 73 - died on February 15, 2003 at Menifee Valley Medical Center in Sun City, CA of undisclosed causes. He had been a contract administrator for NAA/RI in Downey before his retirement. He is survived by his wife, Calista. Notification sent in by Sonnie Robertson.

DODSON, GAIL M., 62 - died peacefully with her family at her bedside on December 20, 2002 in Nipomo, CA of undisclosed causes. Gail had worked at Rocketdyne as a financial adviser for 20 years, retiring in 1996. She is survived by her husband, Harry.

EYESTONE, MAROLD "STONEY" C., 87 - passed away on February 9, 2003 in San Pedro, CA of undisclosed causes. Marold began his career at NAA in July 1937 as a cable splicer on the B-25 line before joining the engineering department. He had worked on many projects including the Apollo and Space Shuttle programs before he retired in 1973. He was a long time member of the NAA Hangar Gang. He is survived by his loving wife, May.

FANNING, MARION, 94 - of Laguna Woods, CA died on November 17, 2002 of a stroke. She had been a secretary at NAA/RI.

FARLEY, WILLIAM H. "BILL", 79 - died February 9, 2003 of complications following surgery. He lived in Mission Viejo, CA and was an aerospace engineer for NAA/RI. He is survived by his loving wife, Lucille.

FRISSO, WAYNE E., 86 - of Placentia, CA died October 29, 2002 of natural causes. He was an aerospace technician at NAA/RI.

GIBSON, FREDERICK I., 87 - died January 31, 2003 of natural causes. He resided in Anaheim, CA and was a retired mechanical engineer for RI. He is survived by his loving wife, Anna.

GIGLIO, MAURICE M., 78 - died November 30, 2002 of a heart attack while visiting his son in Valencia, CA. He had worked for NAA/RI for 48 years in Logistics at LAD and later at Space Division in data management before he retired. Retirement became boring so he went back to work part-time at the Autonetics gym.

GILLESPIE, RALPH L., 77 - passed away November 7, 2002 in Santa Monica, CA of undisclosed causes. He had worked at Rocketdyne until his retirement in 1987. He was a long time resident of Venice, CA.

HANLEY, JOHN H., 78 - of Anaheim, CA died January 2, 2003 of pneumonia. He had worked as a shipping and receiving clerk for RI. He is survived by his loving wife, Eve.

HARE, FRANK W., 67 - died December 7, 2002 of a heart attack in Chula Vista, CA. He was an engineer at Autonetics. He is survived by his loving wife, Eve.

HARVEY, QUINTON C. "QC", 79 - passed away on January 28, 2003 at his home in Fallbrook, CA of a heart attack resulting from internal complications. He retired in 1983 after 30 years of service as a flight test engineer on the X-15 and B-1 programs at LAD and several space programs at Downey, CA. He is survived by his loving wife, Peg.

HEINMILLER, WAYNE L., 66 - died in Long Beach, CA on May 31, 2002 of a heart attack resulting from complications due to renal failure. Wayne had retired after 32 years of service as an electrical engineer at the Downey and Seal Beach facilities where he was the project manager of the anechoic chamber. He is survived by his loving wife, Dolores.

HOAGE, W. GRANT, 79 - passed away peacefully at home with his family in Orange, CA on December 18, 2002. Grant started working at NAA in 1962 , left, returned and subsequently retired in 1999. Most of his career was spent in the Downey Project Office but he will best be remembered for his charitable works as a chairman of the Donate Once committee. He helped establish a sponsorship program for four schools in Bakersfield, CA named after four of the Space Shuttle Orbiters. He is survived by his loving wife, Edith.

HORNECKER, CHARLES W., 76 – died on June 19, 2002 at Hemet, CA of cancer. Charles was a member of the 10th Mountain Division during WWII. He served in several engineering management positions at Autonetics from 1953 to 1983. He is survived by his loving wife, Violette, in San Jacinto, CA.

HULL, STANLEY K., 73 – of Anaheim Hills, CA passed away on January 15, 2003 of undisclosed causes. Stan met his wife at NAA in 1963 and remained with NAA/RI for more than 30 years, retiring in 1994. He is survived by his wife of 38 years, Beverly.

JONES, VIVIAN L., 62 – died in Grass Valley, CA on December 2, 2002 as result of cancer. Vivian retired from Rockwell in 1995, having worked as an executive secretary for 12 years. We were informed by her loving husband, Edgar, who is also a retiree.

KAUFMAN, DARRELL L., 66 – passed away on November 5, 2002 of undisclosed causes. After 35 years of service on the Navajo, Apollo and GPS programs, he retired in 1991. Information provided by Don Kaufman.

KOEPPEN, WALTER J., 75 – of Tustin, CA, died on December 5, 2002 of cancer. He had been an electronics engineer at RI.

KOOLER, HARRY B., 73 – of Rogue River , OR passed away on May 18, 2002 at Providence Medford Medical Center. He retired from RI in 1987 after 35 years of service in Downey, CA. He moved to Oregon 15 years ago and was very active in the community and in volunteer services.

KRONENBERGE, ROBERT, 91 – died in Fort Lauderdale, FL on December 4, 2002. Bob had worked on the Navaho X-10 flight test program at Edwards AFB and later at Rocketdyne. After retirement, he worked as a captain on private yachts in Florida until failing health slowed his activities.

LANDRUM, LESLIE L. "BUD", 79 – died on December 21, 2002 at his home in El Segundo, CA. Bud had worked at LAD and Space Division in aerodynamics. He retired in 1984 and is survived by his loving wife, Margaret.

LESCARD, BENJAMIN, 81 – died on February 7, 2003 at Cypress Gardens Convalescent Hospital in Riverside, CA. He had been a stock clerk at NAA/RI for 36 years. Ben had no immediate survivors.

LISCANO, ROBERT, 58 – died on January 17, 2003 of Lou Gehrig's disease. Bob had been a project manager at NAA/RI in configuration management. He is survived by his loving wife, Loraine.

LIVINGS, ROBERT E., 74 – died at his home in Perris, CA on February 13, 2003. Gene served in the U.S. Army and National Guard for 21 years. He was a trucker at NAA/RI in Seal Beach for 33 years. He is survived by his loving wife, Alma.

MILLER, FRED H., 81 – of Anaheim, CA died on February 10, 2003 of lung cancer. He had retired from Autonetics in 1977 where he worked on the Apollo Space Program.

PAPPAS, GEORGE, 79 – of Morongo Valley, CA passed away on November 15, 2002 of cancer. George retired in 1984 as a supervisor after a long career in plastics and bonding manufacturing. He is survived by his loving wife, Beverly.

PEARSON, MERVIN J., "DUKE", 82 – passed away on January 8, 2003 in Palos Verdes, CA of complications following a stroke. "Duke" began his career at LAD in 1941 as an LAD field service instructor. He transferred to Autonetics in a management position and later joined the Space Division on the Apollo Program. After taking early retirement he returned to work at LAD on the B-1 program.

PULFREY, JOANNE O., 73 – died on November 1, 2002 of undisclosed causes. She had worked at NAA as a bookkeeper before retiring.

PULTS, WATSON R., 88 – of Long Beach, CA died on February 5, 2003 at a San Luis Obispo, CA nursing home. Cause of death was not cited. He had a 30 year career as an aerospace engineer at NAA/RI including work on the Apollo Program. He was also an active member of the Glider Pilot Association for many years.

QUACKENBUSH, ROBERT L., 74 – died on September 2, 2002 at the Health and Science University Hospital in Portland, OR of undisclosed causes. Bob had lived in Lake Elsinore, CA for 18 years and had been an aeronautical engineer for NAA/RI.

RAFTERY, HELEN, 88 – passed away on January 29, 2003 at Brighton Gardens in Carlsbad, CA. Helen started at NAA in 1937 and became executive secretary to E.D. Starkweather, Vice-President of Human Resources. She retired after 35 years of service.

RIEKEMAN, ELMER C., 90 – if Irvine, CA, died on December 30, 2002 of natural causes. He had been an engineer at NAA/RI.

RUPEL, ED, 81 – passed away on January 7, 2003 at a nursing home at Laguna Woods, CA. Ed joined NAA in 1948 in tooling and advanced to assistant general supervisor at the Downey facility. He also worked at Seal Beach, LAD and Cape Canaveral before retiring in 1982. He is survived by his loving wife, Bobbie.

SANGER, MARVIN, 79 – passed away on November 8, 2002 from heart problems and strokes at Grass Valley, CA. Marv worked in field service and engineering at LAD and Space Division. During WWII he served as a military flight instructor and a ferry pilot delivering fighter aircraft to Alaska. He retired from NAA/RI after service on the Shuttle Program. He is survived by his wife of 51 years and extended family.

SCHMITZ, CONRAD, 81 – died January 6, 2003 of undisclosed causes. He was a retired instrument mechanic at NAA/RI.

SLATER, CHARLES N. JR., – died on November 13, 2002 as a result from complications arising during surgery. Charlie worked as a mechanical engineer at NAA/RI for 33 years, including work on the F-86, F-100, X-15, XB-70 and B-1 aircraft and the Apollo, Skylab and Space Shuttle projects. He is survived by his loving wife, Suzanne.

TASCHNER, GUSTAV U., – passed away on July 16, 2002 of brain cancer in Palos Verdes, CA. He was a retired mechanical engineer at NAA/RI. He is survived by his loving wife, Vera.

TAYLOR, CLARENCE E., "ED", 85 – of Anaheim Hills, CA, died on December 4, 2002 from cancer. He was a retired engineer.

TEEPLE, GORDON G., 84 – died January 22, 2003 at Beaumont Care Center in Sun City, CA. He had been a materials manager at NAA/RI for 26 years. He is survived by his loving wife, Marie.

THRUSH, LEONARD E., 91 – of Newport Beach, CA died October 8, 2002 of natural causes. He was a retired manager at NAA/RI.

THOMPSON, RICHARD "DICK", 70 – passed away at his home in Krebs, OK on December 18, 2002 of cancer complications. He was an Autonetics quality assurance engineer at the McAlester, OK facility since 1971.

THOMSON, JOHN S. "JACK", 88 – passed away on July 28, 2002 at his residence in Villa del Sol in Mission Viejo, CA of undisclosed causes. After the Korean War, Jack went to work for and eventually retired from NAA/RI. After retiring he pursued a successful acting career.

VAN PELT, EDWARD G., 86 – passed away in Las Vegas, NV of a stroke on September 27, 2002. Ed had worked as an engineer at the Downey Facility.

WAGONER, EARL V. JR., 77 – died on January 6, 2003 at San Pedro, CA. With a degree in physics he worked at NAA for 21 years. He is survived by his loving wife, Kathy.

WAY, PAUL E., 77 – of Palos Verdes Penninsula, CA, died on November 21, 2002 at Torrance Memorial Hospital of brain cancer. Paul started at NAA/LAD as an armament design engineer in 1947, later he moved to Downey to work on the Apollo and then returned to LAD to work on the B-70. He retired in 1974 after 27 years of service.

WEGNER, EARL T., 80 – passed away March 24, 2002 in Columbus, OH of undisclosed causes. A veteran WWII USN aviator, Earl retired from the Columbus Plant.

WENZEL, JOHN, 71 – of Palms Springs, CA died on January 15, 2003 of a heart attack. John was a program manger. He is survived by his loving wife, Rae.

WHITE, PHYLLIS, – died on October 12, 2000 of undisclosed causes. Phyllis retired in 1983 after a successful career as an executive secretary in the Logistics/Engineering area. Her passing was reported by her daughter.

YOUNGER, ELMER W. "AL", 80 – died on December 14, 2002 of undisclosed causes. After serving in the Air Force during the Korean War, Al joined NAA and worked on the Hound Dog program, Apollo projects and the Space Shuttle program. He retired after 35 years in the industry. He is survived by his loving wife, Betty.

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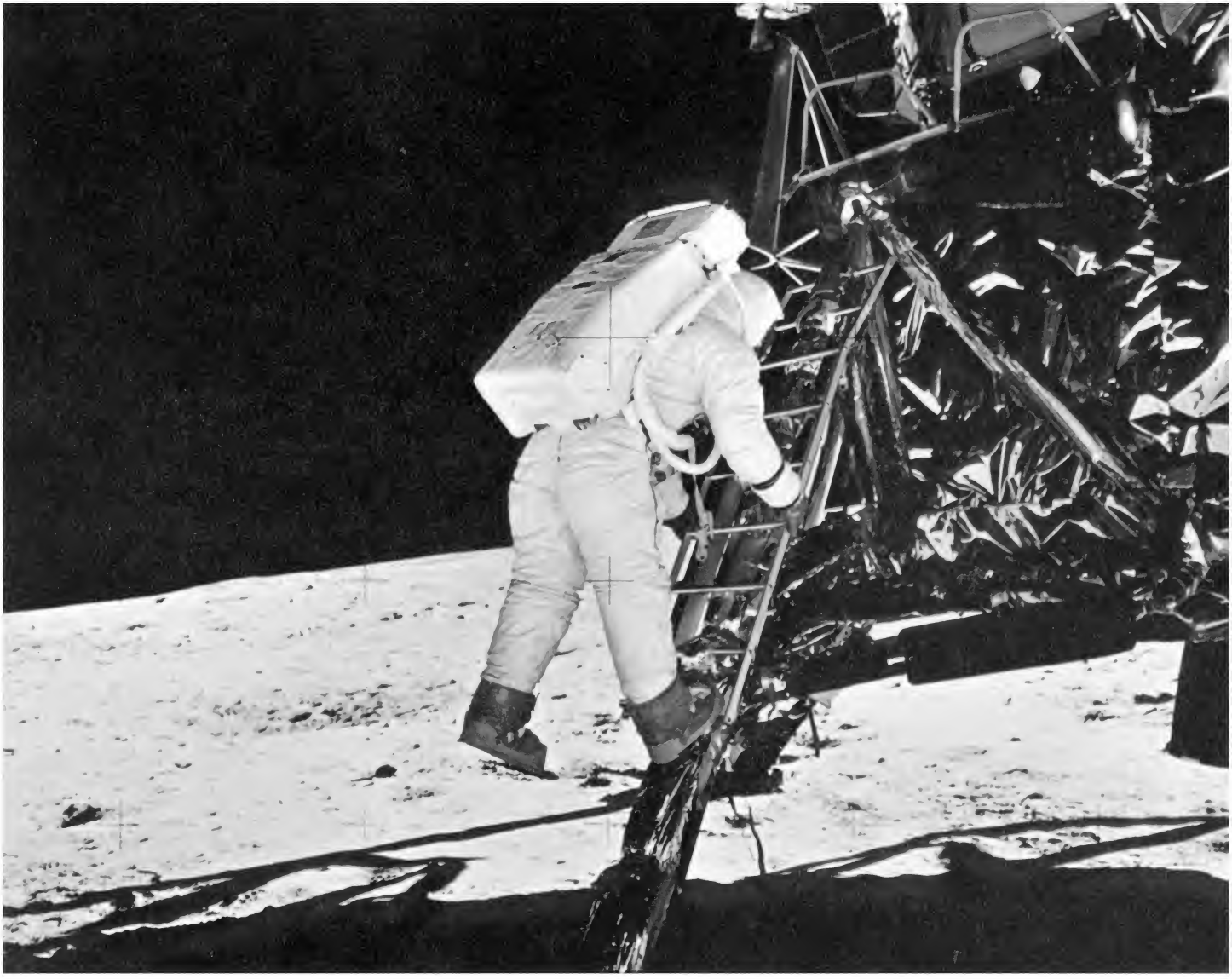
The YF-93A, NA-157, 48-317, was one of two prototypes built. First flown by George Welch on January 25, 1950, equipped with an afterburner, the aircraft attained a top speed of 708 mph at sea level and an incredible rate of climb of 11,960 feet per minute.

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION Retirees Bulletin

Summer 2003

Inside: **FROM APOLLO TO AIRPLANES, PART II** by Dale Myers
THE LAST FLIGHT OF THE SECOND F-107A by William Simone
NAA IN EUROPE – THE COLD WAR YEARS, PART II by Robert Clark
THE XFV-12A – A SUPERSONIC V/STOL by Erik Simonsen



NASA Photo

ASTRONAUT EDWIN ALDRIN JR., LUNAR MODULE PILOT, DESCENDS THE STEPS OF THE LUNAR MODULE AS HE PREPARES TO STEP ONTO THE MOON. PHOTO WAS TAKEN BY ASTRONAUT NEIL ARMSTRONG, COMMANDER, DURING THE APOLLO 11 EXTRAVEHICULAR ACTIVITY ON JULY 20, 1969.

NORTH AMERICAN AVIATION
Retirees Bulletin

NAAR BULLETIN, an affiliate of the **Bald Eagles, Inc.**, is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

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DEAR NAA RETIREES BULLETIN SUBSCRIBER

If you subscribed to our directory, you should have received your copy and are enjoying it. This has been a massive job for Sonnie Robertson and she has accomplished a truly fantastic reference document. You cannot imagine the amount of time she spent corresponding, checking and double checking to be sure that all the entries were as correct as humanly possible. The cost of the final product exceeded the amount charged but we felt the money was well spent.

If there ever was any question of the deadly effectiveness of the B-1B bomber, you only had to read the article *HOW TO ATTACK A DICTATOR, PART II* in the April 21, 2003 issue of TIME magazine. Within 45 minutes after Saddam Hussein was sighted by a ground observer entering a restaurant in Baghdad, a B-1B, named *"Seek and Destroy"*, unleashed two 2,000-lb. smart bombs, known as JDAMs, followed by two more with surgical precision right on target! The B-1B has become the workhorse of the Iraq War. With this said, the guest speaker at the annual Bald Eagles luncheon this year was Scott White, the B-1B General Manager. Although much is still classified, he gave a splendid accounting of the excellent performance of this beautifully engineered aircraft.

In this edition, we bring back some of our story tellers from previous issues to continue their experiences as part of that fantastic North American Aviation team. Bill Simone also brings us another wonderful F-107A saga. And you, our readers, have also provided us some terrific excerpts which solidify our feelings that NAA, the management and the people that worked there, whether it was in engineering, manufacturing, flight test, quality, field service, personnel, purchasing or contracts, were the very best in the industry!

Until our next issue, stay healthy and may you always stand in the shadow of God's Blessing!

THE SECOND ANNUAL B-1 REUNION LUNCHEON

Will be held on Saturday, September 20, 2003
from 12:00 Noon to 4:00 PM at the
Golden Sails Hotel
6285 E. Pacific Coast Highway
Long Beach, California
Contact Lee French at (562) 866-9435 or
Lynn Isomoto at (562) 496-5604

THE 7TH ANNUAL COLUMBUS FACILITY REUNION

All retirees and former employees of Curtiss Wright, North American Aviation and Rockwell International associated with the Columbus Facility are cordially invited to the 7th Annual Reunion to be held on Sunday, September 7, 2003 from 12:00 Noon until 5:00 PM at the Whitehall Community Park, formerly known as the Rockwell Recreation Park, on N. Hamilton Road in Whitehall.

For more information, contact Dent Williams at (614) 866-0663.

NAA/ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Bill Kelley at (714) 637-9374.

The Antelope Valley Retirees Club meets in the South Meeting Room of the Palmdale Culture Center at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell/Boeing retirees are welcome. For information, contact Bill "Tiny" Kisler at (661) 273-0213.

Boeing Valley Retirees Club meets on the 3rd Thursday of each month at the Canoga Park Rec Center, 8500 Fallbrook Avenue, Canoga Park, CA. The president is Jennie Muncaster at (818) 341-8919.

"The Old LAD Stress Group" meets for breakfast approximately every two months at Mimi's Café in Torrance, CA. If you are from the old LAD Stress Group contact Gene Laxton at (310) 378-3113 or Ed Rosenthal at (310) 375-8933.

"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meet at 11:30 AM on the 2nd Wednesday of the month for lunch at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd. and Mariposa Ave.

The NAA 101 Tooling Retirees Group meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at the Cimarron Café, 5160 190th St., west of Anza Avenue in Torrance, CA.

GPS Breakfast Club meets from 6:00 AM to 8:00 AM every Wednesday at the Primrose Restaurant, corner Seal Beach Blvd. and Westminster Blvd. All are invited. For more information, call Fred Shitara at (714) 750-1016.

Seal Beach Retirees Group meets at 11:30 AM on the 3rd Wednesday of the month at "The Fish Co." on Los Alamitos Blvd. at Katella Avenue. For more information call Marvin Blaski at (714) 848-5717 or e-mail to *mblaski@aol.com*.

The Facilities, Industrial Engineering and Plant Service Retirees Group meets at 11:45 AM on the 2nd Thursday of each month at Buster's (formerly Jolly Roger's) Restaurant in the Long Beach Marina. Contact Joe W. Mausser at (562) 596-5845.

Downey Engineering Group of Retirees known as the "Choir Boys" meets every Thursday for lunch at various restaurants from Downey to Seal Beach. Call Al Risi at (714) 892-5725 for meeting location.

"Ye Olde Pharts Breakfast Club" meets at 10:00 AM on the 4th Thursday each month for breakfast at Polly's Pies at 2025 N. Tustin Avenue in Orange. For information call Don Metzger at (949) 495-5374.

The North American Rockwell Retiree Club of McAlester, OK (a satellite of Tulsa, OK) meets at 10:30 AM on the 3rd Tuesday in March, June, September and December at the Down Town Meeting Place. Call J. A. Darden at (918) 423-0706 for more information.

Tulsa & McAlester Retirees meet for breakfast at 8:00 AM on the 2nd Monday in March, June, September and December at the Ramada Inn, 8181 East Skelly Drive in Tulsa, OK. Call Harly Phillips at (918) 838-3716.

The North American Rockwell Retirees Group of Columbus, OH Engineers and professionals meet at 11:30 AM on the 3rd Thursday of each month at the Berwick Park House. Contact Byron C. Solomides at (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH meets at Noon on the 1st Monday of the month at the Old Rockwell Park on North Hamilton Road. Contact E. Hamilton at (740) 927-5940 for information.

Autonetics Group including Marine Systems, Program Office, Project Office, System Test, Engineers and Designers meets for lunch on the last Wednesday of each month at the HomeTown Buffet, Rose Avenue and Alta Vista Drive in Placentia, CA. Call Mike Vohs at (714) 762-1925 for more details.

Autonetics Industrial Engineering and Maintenance Retirees meet for lunch on the 1st Thursday of each month at the HomeTown Buffet, 390 McKinley, located in front of the Home Depot, in Corona, CA. For more details, call Don Burt at (909) 698-0072.

Autonetics Flight Control Retirees meet at 11:30 AM on the 3rd Thursday of each month except December at "The Lamppost Pizza House" located at 17568 Yorba Linda Blvd., corner of Richfield Road, in Yorba Linda, CA. Call Jim Anderson at (714) 779-5620 for details.

Autonetics Retirees meet for lunch at 11:45 AM on the 2nd Wednesday of every month at the Rembrandt Restaurant, 909 E. Yorba Linda Blvd., Placentia, CA. All Autonetics retirees, spouses and friends are invited. Contact Robert Nease at (714) 971-7870 or e-mail to *rfnease@email.msn.com* or Ed Venanzi at (714) 779-5652 or e-mail to *EdVennz@aol.com*.

A Group of NAA Retirees meets for breakfast at 8:15 AM on the 1st Wednesday of each month at Knott's Berry Farm-Chicken Restaurant. All are cordially invited. Contact Maxine Haun at *maxi3131@aol.com*.

Autonetics Financial Luncheon Group meets for lunch at Noon on the last Wednesday of the month at Carrow's located at 100 N. State College in Fullerton. Contact Ken Cantwell at (714) 970-7171 or *Kcantwell@prodigy.net*.

A Group of Engineer Mgt. meets at 11:30 AM on the 3rd Tuesday of the month for lunch at Denny's on Imperial Hwy and the 57 Fwy. Call Ed Moran at (562) 697-9949 for information.

NAA Tech Reps Assn. (TRA) Breakfast Club meets at 9:00 AM on the 1st Tuesday of each month at the Carlsbad Airport Restaurant. For more information, call El Presidente Rafael Colunga at (760) 940-0525.

Material Group Retirees from Downey and Seal Beach meet at 11:30 AM on the 4th Wednesday every month at the Stox restaurant at Imperial Hwy. and Bellflower Blvd. in Downey. Contact Marian Nielson at (562) 429-1020 or Joan Dominguez at (562) 865-7200 or e-mail to *tatedom@aol.com* for location.

ANNUAL EVENTS

B-1 Program Annual Reunion – The 2nd annual reunion luncheon will be held at the Golden Sails Hotel, 6285 E. Pacific Coast Highway in Long Beach, CA on Saturday, September 20, 2003 from 12:00 Noon to 4:00 PM. All B-1ers are invited. Contact Lee French at (562) 866-9435 or Lynn Isomoto at (562) 496-5604.

Columbus Facility Annual Reunion – All retirees of Curtis Wright, NAA and Rockwell associated with the Columbus facility are invited to the 7th annual reunion on Sunday, September 7, 2003 from 12:00 Noon until 5:00 PM at Whitehall Community Park. Contact Dent Williams at (614) 866-0663 for details.

Grants Pass Picnic – Held the 1st Wednesday after Labor Day, September 3, 2003 at Indian Mary Park in Grants Pass. Contact Bob Morse at (541) 474-1438 or e-mail to *lindabob@internetcds.com*.

North American Flying Horsemen (NAFH) Reunion – The annual reunion will be held Saturday through Monday, September 6th through 8th, 2003 at Bob and Linda Morse's home in Grants Pass, OR. Contact Bob or Linda Morse for reservations at (541) 474-1438 or e-mail to *lindabob@internetcds.com*.

The Hangar Gang – This group of retirees meets approximately every 6 months. For time, date and other details, call Gene Salvay at (818) 788-3974 or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

Annual Flight Test Instrumentation Reunion – This group of retirees meets annually at the Fullerton Elks Club. For information, call Frank Vigil at (562) 691-0236.

Tech Rep Association Picnic – A group of retired Field Service Technical Representatives has a yearly picnic in June at a park in Fallbrook. For more information, call TRA President Rafael Colunga at (760) 940-0525 or e-mail to *rafael@nctimes.net*.

The Annual M&P, P.D.L., "Friends Christmas Luncheon" – This group of retirees and employees have assembled in mid-December for a festive luncheon and gabfest for the past 19 years. Those wishing to participate and receive notice of the next December luncheon, call Fred Koeller at (310) 545-8854.

NAA-K B-25 Reunion – Will be held on Sunday, August 17, 2003 at 1:00 PM to 5 PM at the Wyandotte County Museum. For more information, call Harry J. Desko at (913) 287-7223 or write to him at 3024 N. 47th St., Kansas City, KS 66104.

Autonetics Group 69 – Will hold the Every-So-Often Reunion Luncheon on Wednesday, October 22, 2003 at 11:00 AM at the Alta Vista Country Club in Placentia, CA. For information, contact Bob Nease at (714) 516-1844 or John Pinson at (714) 637-9146.

From Apollo To Airplanes (Part II)

by Dale D. Myers



The author covered his first 21 years with North American Aviation in the Fall 2001 issue of the NAA Retirees Bulletin. *His story continues with this segment.*

The success of the Apollo Program could be directly attributed to the NASA bringing its experience from the Mercury and Gemini programs and NAA bringing its design ingenuity and pragmatic approach to building great airplanes and the competence gained in space components and systems derived from the X-15 and the Navaho. Both had wonderfully talented people. The best engineers in the world wanted to go to the moon!

The Saturn V Program was started in 1959 by ARPA and NASA. On May 25, 1961, just one month after Yuri Gagarin flew one orbit around the earth, President Kennedy announced the Apollo Program. It took 14 months of often violent differences to thrash out the program hardware concept. In 1961, the plan was to go direct and return in the same vehicle, using two or three Saturn V vehicles (or more to Von Braun's liking, a single even bigger booster). By July 1962, top program management agreed on the lunar orbit rendezvous approach. This provided the LEM and NAA could finally define in general terms, a Command Module and a Service Module.

I say "in general" because there was a long way to go before we had anything to build. NASA had a lot of good people, most of whom did not have a manufacturing background, and NAA had people dealing with many new systems with little experience in the new environment of space. NAA's background with the X-15 was important and Charlie Feltz was very well respected, but NASA and NAA program level management just could not see eye to eye. Finally, Bob Gilruth, the Director of Johnson Space Center, and Harrison "Stormy" Storms agreed to change the program managers at both locations. That's how Joe Shea, a brilliant NASA engineer with a strong background in electronics and systems engineering, and I got our respective jobs.

Our assignment was to talk to each other—a lot, and to try to get subsystems defined and changes under control. We were flying dummy command modules on S1B's in 1966 and on the first Saturn V in 1967. Our major step forward in program management was to establish a Block 1 configuration for systems that had to operate in earth orbit only and a Block 2 configuration where everything had to work to the moon and back. With these definitions, we were able to start a more rigorous configuration control system. Unfortunately, that system did not become foolproof until after the Apollo 204 fire, where three great guys, Grissom, Chaffee and White, died in the Command Module during checkout on the pad at the Cape.

Many things happened after the fire. First, the 16 psi pure oxygen for testing in the command module at the Cape was dropped, and mixed oxygen and nitrogen was introduced (the astronauts remained on pure oxygen in their suits). Second, the hatch was redesigned to open outward, so if pressure built up inside, they could get out in three seconds. Third, we talked to each other a lot more. I honestly don't think that I was ever told that the command module would be at 16 psi oxygen in the tests at the Cape, and was stunned that it happened! NAA hadn't even tested materials at 16 psi, but we sure knew how fantastically dangerous it was. It had been difficult enough to develop materials that would not burn at 5 psi. So we became more involved in NASA test planning and made our change control even more rigorous. I went to Houston every week to attend George Low's Change Control Board. George became Program Manager when Joe Shea left NASA after the fire.

And Fourth, we all sharpened our need to do everything right, to report every failure in test or even analysis, and to get on with the program. We lost about a year and a half getting into manned flight, but when we did fly, everything worked.

Wally Schirra's flight in Apollo Seven was so good that the only complaint he had after the flight was a fingernail sized beta cloth he found floating in the cabin.

In fact, the flight was so good that George Low went to George Mueller, the Associate Administrator for Manned Space Flight, and proposed that the second manned flight be around the moon. I was formally asked to sign off on the safety of that flight, and I am sure some of you remember me quizzing you about your confidence in the subsystems you were responsible for. Everyone was ready to go, so I signed. That was Apollo Eight with Frank Borman, Jim Lovell and Bill Anders, a very brave crew. Bill took the pictures of the blue earth that I am sure had a major impact on world interest in our environment. Bill also said that he was the first man to the moon because he was in the couch on the right side, and it got there first (he says).

Apollo Nine was another earth orbit flight that I remember mostly because one of the astronauts (who will remain nameless) got very airsick. Apollo Ten was commanded by Tom Stafford, and while in lunar orbit, some control function failed to work and they had to switch to backup. During the process, some



Photo from the Ed Rusinek Collection

An Apollo Command Module boilerplate being dropped from a trapeze at various angles into a basin at the Downey facility to test vehicle characteristics while simulating parachute landing in ocean.

strong words were uttered on an open mike that I had to explain at a subsequent press conference where I said,"Maybe they were talking about their space suits and said 'some of us itch'??".

You are all familiar with our triumphant landing on the moon with Apollo Eleven. During the last few seconds of descent, the computer "overloaded". Everyone in mission control was ready to call for an "abort" but a young guidance engineer on the console had run a simulation with an overloaded computer a few days before, and knew that it was OK for another minute or so. He gave an OK and the crew was able to complete the lunar landing.

I wasn't involved with Apollo Twelve, because I had moved over to advanced design to find a new program to follow Apollo. It was a cloudy day when Pete Conrad was launched, and as the Saturn V lifted off and was rising, it was struck by lightning! EVERYTHING went offline except the reentry batteries. It looked like it was time to abort, but another savvy guy at one of the consoles told the crew to throw a certain obscure switch (only one of the crew knew where it was). They threw it, and all the green lights came back on and everything was fine. Pete was able to land on the moon and hit his golf ball!

That was the end of my work at North American Aviation and North American Rockwell for the Space Division. I was asked by the NASA to leave the industry and become the Associate Administrator for Manned Space Flight and I accepted. It was very tough to leave NAA after 27 years and after having worked so long with so many great, talented, dedicated people.

At NASA, I launched Apollo 13, 14, 15, 16, 17 and Skylab and its three visits, and started the Shuttle Program. Some have said that I went to NASA to get the Shuttle for Rockwell. That is not true. I went because it was a tremendous challenge and I thought I could do some good for the nation. I worked like hell to define the Shuttle, to get Air Force and European cooperation and to convince OMB and Congress that it was feasible. I recused myself from source selection on the Shuttle. George Low came to me after the source selection was completed and asked, "Don't you think Rockwell would be the best team for building the Shuttle?" I still didn't know who had been selected but I responded, "George, you know I can't talk about that!"

I returned to Rockwell in 1974, but I couldn't work on space programs because of the government rules. After I decided to leave NASA, I was fortunate to be asked by Bob Anderson to head up the Aircraft Group, which included the B-1 Division, Atomics International, Columbus and Tulsa. A month after I came to work, I was also assigned the Sabreliner Division and the General Aviation Division.

Sabreliner was interesting. Before I got to the program, someone had ordered $108,000,000 worth of inventory and we weren't selling airplanes. The airplane had been designed like a fighter plane, full of bits and pieces and very expensive to build. It also did not have cross-country range. I got the idea that if we could get the cross-country range, we could sell some airplanes and get rid of that warehouse full of parts. I got Lee Atwood to come back from retirement to oversee the structure and tank changes, and particularly the wing extension to give us the range we needed. It worked. We didn't make much money, but we sold a bunch of airplanes, got the parts problem under control and developed a really nice cross-country airplane.

General Aviation, with the Aero Commander, the single engined 112, and the crop dusting aircraft was finding ways to cut cost and improve reliability. The Aero Commander was a pilot's airplane as was so ably demonstrated by Bob Hoover, but the passenger compartment was too noisy. We were working on noise suppression technologies when I left in 1977.

Tulsa was building structure for the 747, and doing very well thank you.

Columbus had built the Vigilante Mach 2 carrier based bomber. It was a beautiful airplane, but was out of production and phasing down. Their big project was a unique blown wing vertical takeoff and landing fighter for the Navy. Money was scarce, they had to scrape along on minimum test facilities and never did get to where they could demonstrate free flight. I was never sure that the concept made sense, but there were a bunch of bright guys at Columbus with lots of experience who were sure it would be a star performer.

Atomics International was run by Sam Iacobellis in a world that had been started by Chauncey Starr at the same time Aerophysics Laboratories was started. Sam was finding new markets in the nuclear power plant business and always had his program control in order.

The B-1 program needed a little prodding to get the Air Force and Rockwell to talk to each other more often, because the program was going very well but the Air Force was too aloof to realize it. A year and a half later, the B-1 program was named by the Air Force as it's best managed program. Thank you, Buz Hello!

Not long after receiving that prestigious recognition, President Carter came into office and cancelled the production of the B-1 in 1977. Senator Jackson had said it was too expensive. I wonder how he felt when the true cost of the B-2 was revealed? The B-1 flight test program was underway at the time of cancellation, and all the performance data looked good. We had convinced the Air Force to continue the flight test program, and that decision proved to be vital in the reestablishment of production under President Reagan in 1981.

Shortly after the cancellation, I received a call from President Carter. He wanted me to accept the position of Under Secretary of the newly formed Department of Energy. They had several multibillion dollar programs that were in need of good program management. I told Carter that I was a Republican and that I would have a very hard time supporting his policies in front of Congress. Carter responded,"Don't worry! We'll have Jim Schlessinger do all the testimony." I was so naive about Congress that I thought that could be done. The big swinger was that my father had said many times that if the President ever calls you, you've got to go and serve. I think that I had never been in the military also influenced my decision. In any case, I went and regretted it. I said I would go for two years, but being in a liberal camp, and being called to Congress to testify all the time, where I felt like I was on the verge of perjury trying to support Carter's dumb policies, drove me out in 18 months.

So that is my story. A wonderful adventure, surrounded in the early days by people like Dutch and Lee, Ralph Ruud and Stan Smithson, and my direct bosses, Ed Horkey, Bill Bollay, Joe Beerer, and "Stormy" Storms and later by Bill Bergen and Bob Anderson. All of them were outstanding, talented people. I learned from all of them and I had a ball doing it.

One person I worked with through all those years, when I was out of town 1/3 of the time, and when I was home working late almost every night, was my wife, Marge. She bought the houses when we moved, took care of the kids and the house, entertained friends and business guests and did everything else that makes a great marriage. I couldn't have done it without her! We'll celebrate our 60th Anniversary this year!

The author resides with his loving wife, Marge, in Encinitas, California.

North American Aviation in Europe – The Cold War Years (Part II)

by Robert J. Clark

Bob provided us with some insights of his experiences in establishing an NAA presence in Europe during the Cold War in the Spring 2002 Issue of the NAA Retirees Bulletin. *In this issue, he continues his story of fierce technical and political competition and cooperation in marketing our products.*

In the late 1950s, a major NATO military modernization priority was in the realm of day fighter aircraft. Taking the lead in June 1958, elements of the USAF based with the 4th Allied Tactical Air Force at Bitburg, Germany, sponsored a NATO "First Annual Day Fighter Symposium—to further the NATO team concept, to promote a better knowledge and understanding of common day fighter problems and to develop new ideas on day fighter tactics".

One agenda item was "The F-86 Tactics in Korea", another was "F-100 Tactics" and others included "R & D Trends – Films on the F-102, F-104, F-105 and N-156F". I offered the F-100 ZEL test film and it was accepted. U.S. company representatives were invited to Bitburg with the briefings but were told to give our material to a USAF officer who would present it at the meeting. We could not attend or meet with the NATO personnel present.

The ZEL film was reported to have been of considerable interest to the Germans. When the GAF wanted that capability for their F-104G, the Rocketdyne rep in Geneva, Howard Hilderbrand, went to Bonn to work with the GAF chosen booster licensee. Dan Byrnes came over from Corporate Legal to set up an NAA/NAAS.A. agreement for Nitro-Chemie, near Munich, to do the job (it was much later that "Howdy" told Nitro-Chemie that he led the Army unit that blew up their plant at the end of WW II).

Only recently having been allowed a new life and membership in NATO, the Germans had a lot of catching up to do. We looked for access to the hierarchy via a qualified consultant. NAA Headquarters sent over Art Debolt to join John Henderson at our Field Service office in Wiesbaden to interview and enlist Wolfgang Falck, a former WW II night fighter pilot. He was free of political affiliation and with an exemplary professional record. I sought office space for him in crowded Bonn and was finally able to lease a small government guest house. We christened it with a small affair that included the soon to be GAF Chief-of-Staff, General Steinhof.

The French purchased surplus T-28s and modified them at St. Nazaire to operate in the Sahara region during the Algerian fighting. The Algerian revolt was dangerous in France itself because of the passions it aroused in the people. The French Army had declared its attempt to challenge President de Gaulle's policy of liberation with an armed demonstration in Paris, using tanks parked at key locations. We all stayed out of France until cooler heads prevailed. Shortly afterwards, France remained as a member of NATO but cancelled the commitment of its armed forces to NATO command. However, French aerospace companies remained formidable competitors for the supply of NATO military hardware.

Solid and liquid rocket motor development created considerable interest among European companies and we were in contact with MATRA, Aerospatial, SEPR in France, BPD, Gruppo Manfredi in Italy and WASAG-Chemie in Northern Germany. All were hoping to get involved in their country's programs for medium range missiles launched from mobile launchers, silos and submarines.

I suddenly received an urgent call from NAA/LAD to report to the Pentagon ASAP. Together with other American company personnel flying in from Europe, we were ordered by DoD seniors not to discuss rocket motors. No reason was given. Later, a German suggested that a perceived public thought about French missiles attacking Soviet tanks might involve a "dirty" warhead landing on East German soil. We were learning that where the U.S. was involved in NATO, both financial and political sensitivities were needed.

A later surprise came by way of an informal query from Aerospatiale as to whether NAA/LAD would be willing to sell the B-70 flight test program. I assumed that it was to be used to aid the CONCORDE SST development. As I recall, it was George Mellinger that conveyed back a very firm negative. However, I did get to tour the first airplane under construction at Toulouse. Looking down at the uncovered wing it occurred to me that they might as well had carved it out of a one-piece forging.

In 1960, the Columbus Division came to the Paris Air Show with a mockup of the A3J zero-zero ejection seat. Lynn Helms brought it over and both the French and British wanted to try it out in the mockups of their new strike fighters. We went to Hawker/Kingston for a fit in the TSR.2 and the UK Defense Ministry liked it. Unfortunately, Jimmy Martin of Martin-Baker with his national hero stature used all of his influence and kept the seat out of consideration. Next, we took the seat to Dassault in Paris for a fit in the Mirage IV. Again, the design won acceptance but the front cockpit consoles left too narrow a space for the seat. Incidentally, we noted that tactical nuke external mockups were left uncovered in plain sight in the mockup rooms.

Finally, Fiat wanted to see the seat in Turin. Concerned about freight and customs, Ray Goodwin to take a company station wagon to Italy with the seat in the back. He went and returned without incident. Ray cleared customs with the notation "item to be used in a space movie".

My awareness of the Autonetics struggle to obtain the inertial navigation aboard U.S. Navy subs started in 1958 with the pending arrival of the nuclear powered NAUTILUS submarine in Portsmouth, England after its daring voyage under the North Pole ice cap. I flew over and went aboard with the assembled British brass. I was escorted through the forward hatch by Autonetics project engineer Tom Curtis. He was aboard for the entire trip at the request of the Navy to support the inertial navigation system.

It was shortly afterwards that Autonetics sent a representative to London. It was Capt. Charles Rush, retired from WW II submarine service and later the officer and principal planner for the NAUTILUS voyage. Upon his arrival, I was able to lease an "information" office for him in an apartment annex to the Carlton Tower Hotel. He was later joined by John Smith, a former U.S. Marine officer, representing the Rocketdyne Division. Subsequently, Capt. Rush was very effective in the adoption of the Autonetics guidance system for all new British submarines.

As part of the action taken to preclude the MTBF problems being encountered with the Autonetics radar installed on the European Lockheed F-104s, John Moore opted to move the Autonetics radar maintenance operation to Europe. California teams soon came to Europe to find one among the NATO countries. I was asked to conduct a search in Ireland, the Netherlands, Belgium and Luxembourg. In Ireland, buildings were available near Dublin at the Baldonnel Airport (site for the film



Photo from the Larry Davis Collection

Two Canadair CL-13 Sabre Mark 6 Day Fighters of the German Air Force serving with NATO, equipped with the more powerful Orenda engine.

"Blue Max"); but with no electronic expertise available and Ireland being a neutral country, the site was rejected. Nothing was found in Belgium. The Luxembourg Airport, with direct service to JFK had a good facility the auto inspection station—but the willing government couldn't vacate the building in a reasonable time.

Finally, in the Netherlands, we located a small industrial building under construction. It was in a newly created "Polder", a section of land below sea level typically created by a series of dikes. Acting for NAAS.A./Autonetics, I signed a one-year lease for it. Bob Jones of Autonetics became a regular transatlantic traveler along with specialized facility personnel as the construction proceeded. Bureaucratic details required an accurate estimate of manpower to establish cafeteria seating, size and equipment of washrooms and other local demands. To keep the pace up, we became very friendly with the owner and his family and frequently dined together. Everything was done to hurry the completion. Since it rained a lot, much time was spent eliminating leaks.

At almost the exact week of construction completion, a directive arrived from Autonetics to halt the project. I was informed that Lockheed had increased the workload and that a much larger facility was required. This was followed by an agreement with FIAT that their facility at the Turin Airport would be expanded to fit Autonetics needs. Of almost equal importance, FIAT would provide a labor force of their own people. Italian labor laws being very protective, this arrangement relieved many legal concerns and obligations. Acknowledging this as a win-win situation, we paid a one year rent to a very sad and confused Dutch factory owner in the Netherlands.

Leo Killen came to Europe to head the Turin operation. Space was not yet available for him there and he needed temporary offices in Geneva for himself and his core staff. We rented some from newly arrived Caterpillar International and scoured the area for housing. NAA Corporate set up the Turin operation as an Italian company – NAAS.p.A., a subsidiary of NAAS.A.

As time went on, California personnel began to arrive in numbers. I sent administration specialist Tony Pepper to Italy to help find housing, to advise on general living procedures and, of most importance to our families, to arrange for English language schooling for the different ages of children. NAAS.p.A. hired teachers from England who used correspondence teaching material from a Boston company. The curriculum thus assured that proper academic credits were given through high school levels.

In the late 1960s, Columbus Division came forward with a proposal in response to an RFP issued by the Greek Ministry of Defense, the designated NATO administrators, to provide target services for a NATO multi-national anti-aircraft crew training facility on the island of Crete. The targets would fly in an over water range, on a fixed schedule controlled from the contractor's facility, with end-of-flight pickup from the sea and turn-around maintenance provided. The contractor was expected to build a small residence nearby to house his crew during construction of the facility, later to be turned over to the local tourist authority.

Will Yahn, then president of the Columbus Division, phoned to Geneva with the proposal outline, told me he wanted to bring over a few staff and for me to arrange local travel and means to survey the area. I called Olympic Airways and chartered one of their DC-3s out of Athens. We all met there and flew to the island. The pilot was told to hug the shoreline mountains in a certain area where we hoped to find an accessible flat spot to install target control antennas. The pilot loved the idea and barely avoided mowing down the trees!

Finding a possible site; we landed, hired two taxis and proceeded over a paved road which became a gravel road and then a path with rocks. We came to a tiny whitewashed village with a new telephone pole in the central square—electricity was coming next! A few hundred yards away was the very useable site which the crew surveyed while the local women peddled home-woven blankets.

The competition was won by the French, but Northrop took over shortly afterwards. A few months later, we were invited by the Greek government to return to modernize an existing aircraft factory in Greece. It was a very tempting offer until we learned from the Greek underground that the Greeks were training Libyan military pilots. We withdrew and thus ended our Greek odyssey.

About the author: Bob currently resides with his charming wife, Midge, in Channel Islands Harbor where he continues to expand his aircraft library.



Photo from the Larry Davis Collection

An F-86K Airborne Interceptor, A/C No. 55-4822, built by Fiat in Italy and serving with the French Air Force. Carrying a simplified fire control system, these planes were armed with four 20 mm cannon.



Photo from the Larry Davis Collection

A Norwegian Air Force F-86F Day Fighter serving as part of NATO.

The Last Flight of the Second F-107A

By William J. Simone

Long before the completion of flight testing, it was decided that one of the two F-107As would go to the Air Force Museum at Wright-Patterson AFB, Ohio. The Number Two F-107A aircraft, 55-5119, was selected. The original delivery plan called for the airplane to set a world speed record while enroute to the museum, but a sheared wing bolt ended any chance of doing that. In fact, there was even talk of grounding and scrapping the aircraft. It was decided that 55-5119 would be allowed to make one last flight to the Air Force Museum, but at a much slower speed. Major Clyde Good, the NAA Los Angeles Division plant Air Force Acceptance Pilot, was to be given the honors of delivering the aircraft to the museum.

On the 25 November 1957, Major Good took 55-5119 up for this final flight. The revised flight plan called for an interim stop at Tinker AFB, Oklahoma and the final landing at Wright Patterson AFB. The first leg to Tinker AFB took 2 hours and 5 minutes. The final leg to the museum took an additional one hour and 25 minutes.

Major Good recounted the flight for me in 1999. In his own words: "We left from Edwards for delivery to the museum at Wright Patterson. It was a beautiful clear day. I had arranged for Chuck Graham, who was the head of Customer Relations and one of the acceptance pilots for the F-100s and F-86s to take a two-place F-100 and follow me out there to navigate since there were no navigational radios in the aircraft. We got airborne and on such a beautiful day over Arizona I could see Kirtland (Kirtland AFB, Albuquerque)in New Mexico, and I thought that this was going to be a snap. The weather was beautiful, not a cloud in the sky. We went over Kirtland and flew on and landed at Oklahoma City (Tinker AFB, Oklahoma). We got out and had a bite to eat while a North American maintenance man refueled the aircraft and got it ready for the flight into Dayton."

"After lunch we made a quick check of both aircraft and all seemed to be in good order. We both cranked up about the same time. The flight control system (ALCS) on the F-107A had to be turned on after you had the engine started. It was just a little toggle switch, and that was supposed to turn it on. It did not work all of the time, you had to play with it sometimes to get it going. And that is what happened to me there. I was playing with it, trying to get it on. I talked to Chuck, and finally said that I could not get this thing to come on. He really thought that I was going to shut down, and I finally did, but tried it a couple more times. In the meantime, Chuck had shut down the F-100 and the ground crew had reinstalled the gear pins. While I was trying to get ALCS on line, it came on finally and I was all set and gave Chuck a call and told him that I was all set. I told him that I would taxi out and go and he could come and catch me. He said "OK", cranked up really quick and took off. Unfortunately, they had forgotten to take the pins out and he could not get the gear up. He called me and told me that he had to go back and get the pins removed. He would then take off and catch me."



Photo from the William J. Simone Collection
Major Clyde Good, Air Force Acceptance Pilot, exiting the first F-107A, S/N 55-5118, on 6 November 1957.

"Since it was such a beautiful day, not a cloud in the sky, and since there would not be any problems going into Dayton, I decided to push on without any navigation aids. By this time it was getting close to evening. I followed Rte 66 until I got to St. Louis. Just before I got to St. Louis I started to get an undercast. The tops were about 10 to 11 thousand, with an 8,000 foot ceiling. It was just an undercast of about 3,000 feet. It was not bad above, I could see all of the stars shining. It was a beautiful night, and as it got darker, I tried to turn on the cockpit lights but I could not find any switch for the cockpit lights. I looked and tried every possible switch with negative results. I finally decided that they did not put any lights in this thing (the aircraft did have lights, and had flown one night flight on 25 February 1957 while being piloted by Al White). Apparently, the lights had been disabled. I finally decided that it was not a problem. I was not too concerned, assuming that once I got within a hundred miles of Dayton the radar at Wright Patterson could pick me up. I knew the radar at Wright Patterson was very good, having had used it in all weather testing when I was stationed there for in-flight test."

"I had followed Rte 66 to St. Louis, but from there I did not have anything to follow, so I just turned about 10 degrees further east and headed to Wright Patterson. They picked me up about 40 miles north of Cincinnati, and about 45 to 50 south of the base. I felt real good after they picked me up and headed me back towards the base. Radar control started to let me down. As I got closer to the base I asked myself where are the landing gear lights. I looked around but I could not find any landing gear lights. So I decided that they did not put any lights on the landing gear either. But I had my trusty Zippo lighter with me which I carried all the time anyway. I had been using it to look at the instruments. When it got dark, it really got dark. I knew what my airspeed was, but when I slowed to enter the traffic pattern that was another deal. I used the Zippo every so often to check my airspeed so I would not stall out while they let me down on instruments. I broke out at 7,000 or 8,000 feet. I got out under the clouds and there were lights all around and I could see the base off to my left. I entered the base leg using my Zippo lighter to check my airspeed. It was black as the devil in that airplane. No problem. As they turned me onto final I could see the lights on the runway. But I did not have any landing lights. I had made many lights off landings before during flight test, so it did not create a major problem for me, but I used my Zippo lighter all the way down final approach to keep my airspeed at the correct speed. I landed, turned off the runway and taxied over to Base Operations and shut down and turned over the aircraft to the museum people who were waiting for me."

"But I did not bother to tell anybody that it did not have any lights and that I did not have a flashlight with me. For many years, I did not admit to anyone that I did not have a flashlight. It was a stupid thing to do, but I was not used to carrying a flashlight with me. I thought that we would arrive in daylight hours, but instead we got hung up in Oklahoma City so long that it was night when I got to Wright Patterson. Chuck came in about twenty minutes later. If the weather would have been in real bad shape, down to 200 feet or so, I would have been in real trouble trying to hold that Zippo lighter and land when I could not have seen the runway."



Photo from the William J. Simone Collection
The second F-107A, S/N 55-5119, on display at the Air Force Museum at Wright-Patterson in June 1992.

The second F-107A had flown for less than a year, making only 61 flights for a total of 44 hours and 20 minutes. Since it arrived at the Air Force Museum, 55-5119 underwent several modifications. It was once displayed in incorrect markings, with an undersized tail number and a black nose radome being the most obvious. For the next 22 years the aircraft, minus the YJ75 engine, was displayed outdoors. The very harsh weather of Dayton, especially the long cold winters, was not good, causing a great deal of corrosion. In early 1979 the aircraft underwent a complete restoration and is now displayed in the Museum Annex, looking very much like it did while undergoing flight testing at Edwards AFB.

NORTH AMERICAN AVIATION F-107A

By WILLIAM J. SIMONE

A forty year effort, the entire story of the final fighter aircraft built by North American Aviation told in photos, anecdotes, data and drawings. Many never published before. Truly, a labor of love. If you liked Bill's F-107A stories in the NAA RETIREES BULLETIN, you will want this book in your aviation library. Now offered to our readers by the author at a super discount price of $21.00, including packing and postage. Send your order with payment to:

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The Wykes Brothers – 139 Years Of Service

Although the two Wright brothers provided man's first experience with controlled flight, the four Wykes brothers did much to help man and machines fly faster, higher and better. Originally from Boston, the four came westward with one stopping at Columbus, Ohio and the others settling in Southern California.

Robert "Bob" C. applied for a job at NAA's Columbus Division because his wife was from the Midwest. He was hired by Mac Blair, then at Columbus. Mac had worked with his brother, John, in LAD; and decided to hire a second Wykes brother. Bob worked on the GBU-15 guided bomb program and its derivative, the AGM-30. Bob retired from the Missile Systems Division in Duluth, Georgia in 1986 with 32.7 years of service.

John H. joined NAA in 1949. A graduate of MIT, John was named "Rockwell Engineer of the Year" in 1975 while working in dynamics technology at North American Aircraft Operations in El Segundo. A Fellow in the AIAA, he was the author of more than a dozen technical papers. John retired in 1987 with 37.7 years of service.

Raymond "Ray" P. came to NAAO in El Segundo in 1956, where he worked in composite structures and stress analysis. His assignments included the X-15, HiMat, B-1B, and the F-16-XL. He retired in 1987after 39 years of service. John joined the Silent Majority in 1988.

The fourth member of the Wykes family, Donald H., spent his entire NAA/RI career at Space Operations in Downey. Don worked on the NAVAJO, Hound Dog and after a brief sojourn at Northrop, on the Apollo and Space Shuttle where he was manager of Advanced Manufacturing, Tooling Producibility. Don retired in January 1996 after 34 years of total service.

For the record, Bob, Ray and Don all graduated from Bradley University while John, according to his brothers, graduated "from that other school." All together, the four had dedicated 139 years of service to NAA/RI.



The four Wykes Brothers (L to R), John, Raymond, Donald and Robert as they appeared in the* SKYWRITER *in 1983.

Retiree Art Rohr Receives Distinguished Flying Cross After Sixty Years

The wheels of government turn slowly but sometimes it seems like they are frozen in time. During World War II, Staff Sergeant Arthur P. Rohr was a B-25 turret gunner with the 488th Bomb Squadron, 340th Bombardment Group participating in the invasion of Sicily. On 16 July 1943, flying his 12th mission, his airplane went down some 60 miles west of Mount Etna. The pilot and radio operator were killed but the co-pilot, navigator and Sergeant Rohr managed to bail out of the burning aircraft. Scattered over several miles, the other two were captured by a German patrol but Arthur eluded the enemy. Sergeant Rohr walked for two weeks, avoiding the Germans and risking his life by exchanging his uniform for civilian clothes. He made his way through enemy lines, amid artillery and small arms fire, finally meeting up with a patrol from one of General Patton's divisions. He was able to provide the patrol with information regarding the location of enemy soldiers. Sergeant Rohr returned to the 488th Squadron and completed a total of 50 missions.



Photo from the Arthur Rohr Collection
Arthur Rohr back in uniform in 1944 after returning to the 488th Bomb Squadron.



Photo from the Arthur Rohr Collection
Arthur Rohr receiving the DFC from U.S. Congressman Johnny Isakson.

After receiving an honorable discharge and a recommendation for the DFC, Arthur earned a BSAE degree from Ohio State University and was hired by Mac Blair, the head of the Aerodynamics Section at the NAA Columbus Division in November 1951. At the time, the only other engineer in the section was Bill Beach. The production line was being set up for the AJ-2P aircraft. Before he retired in April 1981, Arthur worked on the AJ-2P Savage, T-28B and C Trojan, YAT-28 turbo, T2J Buckeye, OV-10A Bronco, T-39 Sabrejet and the Sprint missile proposal.

In recognition of his WW II heroism, Arthur P. Rohr was awarded the Distinguished Flying Cross on 20 February 2003 at the Vietnam Veterans Meeting held at the American Legion Post in Marietta, Georgia. The presentation was made by Johnny Isakson, U.S. Congressman from Georgia.

Arthur resides with his loving wife, Martha, in Marietta, GA.



Photo from the Arthur Rohr Collection
Arthur in civilian clothes in Sicily after making his way through enemy lines.

The XFV-12A – A Supersonic V/STOL

by Erik Simonsen

Under the auspices of the U.S. Navy VFAX (Vertical Fighter Attack-X) program, Rockwell International was awarded a $47 million contract in 1972 to develop a supersonic vertical lift attack fighter. Designated the XFV-12A, the low cost fighter would operate from a new class of mini-carriers envisioned by the Navy.

To save costs assembling the XFV-12A prototype, existing aircraft components were utilized, including the A-4 forward fuselage and nose/main gear with the F-4 providing the inlets and wing box/main fuel tank. In all, 35 percent of the XFV-12A structure originated from existing aircraft.

Powered by the 30,000 lb. thrust Pratt & Whitney F401-PW-400 engine, the XFV-12A's unique Thrust Augmented Wing system was designed to run ducted air to a full span ejector flap system in the wings and in the canard ducting system. This created boundary layer control similar to the blown flap design of the RA-5C Vigilante. Additionally, mixing primary and ambient air above the wing would provide increased vertical lift and allow for a rapid transition to conventional flight.

During conventional flight, the Mach 2 plus XFV-12A would also be capable of extreme maneuverability, utilizing its direct lift and direct side force control thrust, augmentor flaps and large speed brake.

After a Columbus facility rollout on August 26, 1977, the aircraft was shipped to NASA's Langley Research Center for hover testing while suspended in the lunar training gantry. Although less thrust was produced than predicted by engineers, testing concluded that it was sufficient for vertical flight. Had Computational Fluid Dynamics (CFD) been available at the time to precisely predict the corner flow for the ejectors, the vertical thrust anomalies may have been negated.

Meanwhile, the emphasis on mini-carriers shifted back to the larger Nimitz class aircraft carriers and, subsequently, to larger Navy fighters. Navy funding was eventually suspended in 1979 and the program was cancelled.

It is unfortunate that the XFV-12A was never flown conventionally, as Rockwell had planned, demonstrating extreme maneuverability and Mach 2 performance.

An operational Mach 2 V/STOL attack/fighter during the 1980/1990 timeframe would have been vastly improved through incremental technology. Such performance would have certainly caught the attention of the Marines and might have affected the history of today's subsonic AV-8B Harrier II.



Illustration by Erik Simonsen

Conceptual operational FV-12Bs on combat patrol. Equipped for air-to-air or ground attack missions, the planes featured extreme maneuverability.



Photo from the Erik Simonsen Collection

The sleek and unusual Rockwell XFV-12A prototype on the apron at the Columbus facility after rollout on August 26, 1977. The aircraft had a wingspan of 28.9 ft. and a length of 43.9 ft.

"If I have managed to see farther than others have, it is because I am a midget standing on the shoulders of giants."

— Isaac Newton

The Silent Majority

by Stan Guzy



GEHRKENS, GEORGE R., 88 – died of cancer on April 13, 2003 at Riverside Methodist Hospital in Delaware, Ohio. An Engineering graduate of UCLA, George joined NAA/LAD in 1937 as one of the first engineers of the fledgling company. In late 1940, he became chief project engineer of the Mustang P-51 project and was instrumental in extending the range of the P-51 to provide bomber escort coverage deep into Germany. During the Korean War, he was the senior project engineer of the F-86 Sabre fighter. In 1951, he was assigned as chief engineer of the newly formed Columbus Division, which was destined to become a major supplier of Navy aircraft. These included the FJ Fury series of fighters, the T-2 Buckeye trainers, the revolutionary A3J and RA-5C carrier based attack and reconnaissance systems, the OV-10 Bronco and the Hellfire Missile. George became executive vice president of Columbus in 1962 and retired in 1970 after 33 years of outstanding service. He remained active after retirement in various business and civic pursuits. He is survived by his loving wife, Peggy.

ADAMS, JAMES E., 82 – died on April 23, 2003 from a heart attack. He was a retired engineer from Rockwell International. No further information available.

BERRY, HAROLD F., 81 – died on October 8, 2001 from undisclosed causes. He had worked for NAA for 35 years. No further information available.

BROWN, HOWARD C., 88 – died on May 8, 2003 of cardiopulmonary arrest. He was a retired Rockwell security employee.

BUNCH, DANIEL P., 84 – of Torrance, CA, died of congestive heart failure on April 3, 2003. Dan worked at LAD and retired as a project manager in 1979 after 33 years of service. He is survived by his loving wife, Roberta.

BURAGLIO, IRMA C., 88 – died on February 14, 2003 at Hemet Valley Medical Center of undisclosed causes. She was a blueprint lead woman at RI/LAD for 30 years.

CLARK, JOHN D., 77 – died on March 20, 2003 of emphysema. John had been an engineer for RI and lived in Anaheim. He is survived by his wife, Marjorie.

CLARK, JOHN R., 78 – died on April 18, 2003 at a local hospital in La Jolla, CA from unspecified causes. He worked at RI as a quality control inspector on the Apollo and Shuttle projects before retiring in 1987 with 35 years of service.

CRUMP, JOSEPH L., 73 – died recently at Menifee Valley Medical Center in Sun City, CA of causes undisclosed. He had been a contract administrator for RI in Downey, CA before he retired. He is survived by his wife, Calista.

CRUSE, FRED T. "TOM", 85 – died April 8, 2003 of undisclosed causes with his daughter, Peggy at his bedside. Tom had worked more than 40 years at RI and Lockheed on space projects including the Mercury, Gemini, Apollo and Shuttle Programs.

FERDIG, MELVIN R., 69 – died March 20, 2003 of causes not determined. He was a retired engineer from NAA/RI. He is survived by his wife, Elizabeth.

FERGUSON, ALBERT J., – passed away in November 2001 of undisclosed causes. He was a member of the Bald Eagles. Reported by Val Yarbrough.

FLEMING, ARNOLD "ARNIE" D., 72 – passed away February 26, 2003 after a brief but severe battle with cancer in Sioux City, Iowa. Arnie had worked at Space Division production operations before he retired in 1996 after an exemplary career.

FLORER, EDGAR F., 80 – passed away in April 2003 due to complications arising from a diabetic condition. Ed joined NAA/LAD May 2, 1947 after meritorious service in the Marine Corps during WW II. He worked in the shop while completing his education in night school. In 1962 he transferred to Autonetics where he worked on Navy Programs, filling many responsible positions in Contracts and Pricing. He also worked on the B-1A Bomber Production Program at LAD through the cancellation in 1977. He returned to Autonetics and was assigned as the Washington Rep for Navy Programs. Ed is survived by his loving wife, LaVerne, and son, Jeff. Information provided by George Davis.

FRENCHICK, JR., ROBERT A., 66 – died April 24, 2003 after a yearlong battle with pancreatic cancer. He had over 30 years of service with McDonnell-Douglas, RI and Boeing. He was well respected as a senior scientist and ordnance expert on many NASA space programs including Skylab and Shuttle projects.

GALVIN, CLARENCE W., 81 – died April 19, 2003 at Bradley Gardens Convalescent Center in San Jacinto, CA from undisclosed causes. He had worked at NAA/RI for 35 years before he retired as a supervisor. Mr. Galvin is survived by his wife, Connie. Information provided by Gene Somers.

GARDNER, WILLIAM C. "PETE", – died on March 9, 2003 from undisclosed causes. He had retired from the Tulsa Division in 1989 after 13 years of service. Information sent in by Betty Gardener.

GLASGOW, VERSHEL L., 70 – died on February 21, 2003 in Birmingham, AL. He had worked in the MPS area at RI/Huntsville for approximately 10 years. He is survived by his wife, Faye.

GREER, NORMAN, 92 – passed away in November 2002 from cancer. Norm had worked as a supervisor in the Engineering Empennage Design group and retired from NAA with at least 30 years of service.

GREGG, FRANCES G., 82 – died on March 30, 2003 at her home in Hemet, CA from unspecified causes. She had been an electronics inspector at NAA/RI for 35 years.

HARRISON, CHARLES, – passed away on March 10, 2003 after suffering a debilitating stroke. He had been an NAA/RI employee. No further information provided.

HUFF, ROY J., 82 – passed away on March 23, 2003 at his home in Winnetka, CA from unspecified causes. Roy had worked for many years as a computer programmer in the Weights Group at the Rocketdyne Division and the Aerodynamics Group at the B-1 Division. He is survived by his loving wife, Maebelle.

KELLAM, RICHARD O., 87 – passed away on February 24, 2003 after suffering complications from elective heart surgery. Richard joined NAA in 1947 and worked as a test engineer. He retired in 1975 after 28 years of service. He is survived by his wife, Alice.

KENNISON, ROBERT F., 79 – died on March 23, 2003 of cancer. He was a retired aerospace engineer for NAA/RI. Information provided by Clarice W. Eyestone.

KINSEY, ROBERT F., – died on February 22, 2003 from lung cancer in Sedco Wolley, WA. He had worked in Purchasing at the Rocketdyne Division.

LANGON, CLARK R., 68 – died of a heart attack at his home in Lancaster, CA on December 29, 2002. Clark had retired from NAA/RI after 38 years as a tooling machine shop supervisor; working on the Apollo, B-1 and Shuttle programs at the Downey and Palmdale facilities. He is survived by his loving wife, Allison.

LE BLANC, EDWARD W., 76 – passed away on April 18, 2003 in West Covina, CA from unspecified causes. He had worked as a detail machinist on the Shuttle project. He is survived by his loving wife, Ruby.

LESCARD, BENJAMIN, 81 – died at Cypress Gardens Convalescent Hospital in Riverside, CA. He had been a stock clerk at RI for 36 years. Date and cause of death were not provided and survivors were not mentioned.

LINDSEY, JR., WILLIAM C., 70 – died on March 10, 2003 from unspecified causes. He had worked for RI for 26 years including the Shuttle project. No further information provided.

LIVINGS, ROBERT E., 74 – died February 13, 2003 at his home in Perris, CA from undisclosed causes. He had been a truck driver for RI at the Seal Beach facility for 33 years. He is survived by his wife, Alma.

McARTHUR, MARVIN P., 85 – passed away at Inland Valley Regional Medical Center in Wildomar, CA from unspecified causes. He had been a source inspector for RI/Boeing for 23 years before he retired in 1974. He is survived by his loving wife, Velma.

MELINE, PHILLIP, – died after a lengthy illness of frontal-temporal dementia. He had been an electrical engineer for RI and is survived by his loving wife, Maggie. No further data was made available.

MOLACEK, ANTHONY C., 61 – died on December 24, 2002 of cancer at Loma Linda, CA. He had been an electronics engineer at Global Navigation Systems and RI. He is survived by his wife, Marie.

MORANT, CHARLES A. "CHUCK", 75 – died on October 11, 2002 in Rancho Palos Verdes, CA of Alzheimer's disease. He had helped develop the thermal protection system for the Apollo and Space Shuttle programs and retired in 1988 after 36 years of service. He is survived by his loving wife, Virginia.

NICHOLSON, MARY E., 86 – passed away February 15, 2003 at her home in Moore, OK. Cause of death was not specified. She had retired from LAD Accounting Department in 1982 after many years at the Inter-Division Invoice (IDI) desk.

NICKS, EDWARD W., 72 – passed away on February 4, 2003 from undetermined causes. Mr. Nicks was a RI employee for 28 years including 16 years as Site Director and General Manager of Huntsville Operations. Mr. Nicks was awarded the NASA Public Service Award in 1982 by NASA Administrator, James Fletcher and again in 1988 by NASA Administrator, James Beggs. He is survived by his wife, Adele.

OLSEN, GEORGE V., 87 – died March 4, 2003 at San Gorgonio Memorial Hospital in Banning, CA. Cause of death was not specified. He had been a training director at NAA/RI for 34 years. He is survived by his wife, Mina.

PARKER, DON E., 80 – died October 19, 2002 from cancer at his home in Mission Viejo, CA. Don joined NAA engineering in 1949 and worked on several programs including the B-70, B-1 and Apollo before retiring in 1980. He is survived by his caring wife, Jane.

PAYNE, OTHA L., 73 – died on February 27, 2003 at his home in Perris, CA. Cause of death was not disclosed. He had been a hydraulics bender at NAA/RI for 38 years before he retired.

PETERSON, THEODORE A., 73 – died March 10, 2003 of injuries suffered in the crash of his twin engine, twin tail Beechcraft D18 airplane. The plane crashed on the Cahuilla Indian Reservation, a short distance east of the runway at a Lake Riverside landing strip. Peterson's son, Nord, was also killed in the crash. The elder Peterson was a retired aerospace engineer from NAA/RI. He is survived by his loving wife, Myra.

RHYND, JOHN D.M., 56 – died on December 24, 2002 at the Riverside Community Hospital of brain cancer. He worked as a computing technical support lead person on the B-1 program. He is survived by his wife, Phyllis.

ROOP, BEVERLY J., 81 – died in Fullerton, CA on April 25, 2003 from undisclosed causes. Beverly retired in 1987 after 30 years of service in correspondence control at Space and Autonetics facilities.

SEATON, JACK B., 87 – died March 1, 2003 of heart disease. He had been an electrical engineer at RI. Survivors include his wife, Lamaria.

SHEARER, DONALD F., 75 – died of unspecified causes on March 3, 2003 at Hemet Valley Medical Center. He had been a program administrator for RI at the LAD facility for 20 years. He is survived by his wife of 53 years, Dolores.

SHEPARD, LYDIA, 82 – died on April 7, 2003 at Rancho Bernardo, CA from unspecified ailments. She had worked for RI. No additional information was made available.

SMITH, RONALD A., 65 – died of cancer on April 21, 2003 in Huntington Beach, CA. Ron was employed by RI/Autonetics as an engineer in Code Programming Systems for the Minuteman and Advanced System Missile Program. Ron retired in February 1998 after 38 years of service.

SULLIVAN, JEROME G., 81 – passed away on March 21, 2003 after a long, courageous battle with Parkinson's disease. He began his career at NAA after getting his degree in engineering after WW II. He retired from NAA/RI as a senior design engineer after 31 years of service.

SWEENEY, JOHN U., 77 – passed away on November 10, 2002 at South Paris, ME after being critically injured while crossing a street. John started with NAA 34 years ago as a flight test engineer and retired in 1986. He had worked on several projects including the Hound Dog, Apollo and Shuttle programs. He retired from the Downey facility but had various assignments at Edwards AFB, Cape Canaveral, FLA and Eglin AFB.

TAFOYA, JOE BENNY "JOE", 70 – passed away on December 9, 2002 from a heart attack resulting from head trauma suffered when he fell upon getting out of bed in the morning. Joe had worked at LAD in Tooling as a electronic discharge machining operator. He retired in April 1991 after 36 years of service. He is survived by his wife of 52 years, Josephine.

TEEPLE, GORDON G., 84 – died January 22, 2003 at Beaumont Care Center in Beaumont, CA. He had been a materials manager at NAA/RI for 26 years prior to retirement. He is survived by his wife, Marie.

THOMASON, HOMER S., – died February 21, 2003 of unspecified causes. He retired from the White Sands Test Facility in 1983 after 37 years of service.

WEBER, ELLEN G., – died in September 2002 from a cardiovascular ailment. The information was sent in by her daughter, Cathy Garrity.

WISTOCK, MICHAEL, 84 – died of cancer on March 30, 2003 at his daughter's home in Huntington Beach, CA. He had joined NAA/RI in 1952 and worked on various projects including the X-10, Navaho and Hound Dog missiles. He was sent to Huntsville, AL to serve as project engineering liaison between NASA and the NAA/RI divisions. In 1974 he was assigned as lead engineer on the Shuttle forward fuselage. He retired in 1983 after a long and fulfilling career.

Editor's Note: When submitting obituaries for publication, please include all pertinent information related to the individuals passing. The information desired includes: full name, age, date of death, how, when and where, a short, brief work history (if available), retirement date, years of service and any other information appropriate to a meaningful obituary. And above all the individual must have been an NAA, or an NAA/RI, or an NAA/Boeing employee/retiree. After all, this is intended for the Silent Majority of the NORTH AMERICAN RETIREES BULLETIN!

PAX DOMINI SIT SEMPER VOBISCUM

Contrails From The Past

by Ed Rusinek

Dear Ed,

The recent article by Bill Simone about the F-107 brought back memories of another version of the F-107. I started in 1953 at the Columbus Division in the Aerodynamics Department; working for Paul Titus and Mac Blair in support of the Preliminary Design Group under Frank Compton preparing a Navy version of the F-107 with the designation of FJ-5. It was only a concept design, but it had progressed to the point where two scale models of the design were built. An 0.018 scale model was to be tested at the Ohio State University transonic tunnel and an 0.10 scale model to be tested at NAAL and NACAL. These models were the first to be built in the new NAA-Columbus model shop.

I am enclosing photos of two versions of the models, one with the overhead duct and one without. I believe these models are the only remaining evidence of the FJ-5 project. It never got past the preliminary design phase.

— Bob Wykes, Alpharetta, GA

Ed's Resp.: Thank you for this great vignette about another NAA plane that would have been forgotten except for wonderful readers like you!



Model of the FJ-5 version of the F-107 without the overhead duct.



Model of the FJ-5 version of the F-107 with the overhead duct.

Dear Ed,

Al Martin's article in the Spring 2003 issue reminded me of my involvement in the NAVAHO program when it was transferred to Florida in the mid-fifties. At the time, the availability of housing in the Cocoa Beach area was nil. My boss, Stan Smithson, sent me to Florida to see what could be done to alleviate the problem. I stayed at the Tradewinds Hotel in Indialantic as that was the closest room available.

We wound up guaranteeing the rent for a number of rooms at various motels in the area so that employees would be assured of a place to stay until they could find a permanent solution for their housing needs. As time went on, some enterprising developers came in and built houses, motels and business establishments. As Al described it; for the transferees it was always a love-hate situation.

As to having one of the best jobs in the company, I would like to add mine. My job as real estate manager required considerable travel. Wherever NAA had an office or manufacturing facility, I was involved in the lease or purchase. All commitments were tightly controlled and only senior executives were authorized to sign agreements so I worked closely with that level of management.

Because of my position, I got to meet two U.S. Presidents, numerous governors, mayors and city officials. I was fortunate to be at NAA during the formation of Autonetics, Rocketdyne, and Atomics International which required acquiring different types of real estate in many locations.

After all these years, I still think I had one of the best jobs in the company!

— Donald A. Pehrson, Rolling Hills, CA

Ed's Resp:. The first step to success is to be happy on your job! Are there any other retirees that felt they had one of the best jobs in the company?

IN MY EXPERT OPINION...

"We have struck an iceberg, but there is no danger"

Captain's announcement to the passengers of the *Titanic* - 1912

CONGRATULATIONS and MUCH HAPPINESS to

Bernice and Wayne Huffman of Perris, CA on their 60th Wedding Anniversary



Ralph Ruud, Julius Kany, Chan King, and Al Purcell



Don Safarik, Janet Bisbey and Michael Jurez



Sam Iacobellis and Scott White



Jack Schultz, Cathy Boot and Chuck Mozena



Sarkis Vartarian, Art Goudrealt and Lloyd Wagoner



Ed Rusinek and Ming Lu



Al Keblet, Dee and Doc Blalock

BALD EAGLES

41st Annual Bald Eagles Reunion
April 12, 2003
Photos by Lee French



Ed Mokslaveskas and Maxine Haun



"Andy" Anderson, Bob Pridmore and Ralph Eaglen



Bob Cunningham, Dutchie Langon and Jack Grimes



Linda and Bob Hoffman



Don Safarik and Lowell Ebrhart



Lee Miller, Tom and Penny Ellis



Donna and Bill Bright

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Photo from the Larry Davis Collection

A formation of four North American Aviation F-86K Sabre interceptors of the Netherlands Air Force. Originally designed and built at LAD for use by NATO air forces, subsequent production was performed by Fiat in Italy. A close kin of the F-86D, the F-86K was equipped with a simplified fire control system and armed with four 20 mm cannon. In the late 1950s, Fiat modified many of the F-86Ks to carry the AIM-9 Sidewinder heat-seeking missiles.

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION
Retirees Bulletin

Fall 2003

Inside: **A GHOST FROM THE DISTANT PAST** by Lowell Ford and Morgan "Mac" Blair
A MUSTANG GOES FARTHER WITH A LITTLE POLISH – a Vignette
JACQUELINE COCHRAN – THE FASTEST LADY by Dr. Raymond Puffer
KEEPING THE HUN IN THE SUN by Tom Mackin
F-100 SUPER SABRE – THE VERSATILE "HUN" by Erik Simonsen



Photo courtesy of the AFFTC History Office

THE FIRST THREE XP-86 PROTOTYPES IN FORMATION OVER THE MOJAVE DESERT IN CALIFORNIA. TEST PILOT GEORGE "WHEATIES" WELCH UNOFFICIALLY BROKE THE SOUND BARRIER IN USAF S/N 45-59597 DURING A DIVE IN OCTOBER 1947 BEFORE THE RECORDED YEAGER FLIGHT IN THE BELL X-1.

NORTH AMERICAN AVIATION
Retirees Bulletin

NAAR BULLETIN, an affiliate of the **Bald Eagles, Inc.**, is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

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DEAR NAA RETIREES BULLETIN SUBSCRIBER

We have received a very positive response regarding the Directory and we are very pleased that it has met a certain need within our readership. Speaking of our readership, we are quickly approaching the 400 mark of Silver Eagle subscribers and that means that many of you feel that we are doing a good job of the bulletin. There still are a few of you that get very incensed because there never seems to be anyone in our office to answer your phone calls. I must remind you that we are all volunteers. This effort is strictly a labor of love. Most of the work is done at our individual homes and assembled by a wonderful graphic artist who makes the bulletin look "professional". Boeing provides us with a cubicle and a phone and that is all. Your $10.00 per year pays only for the office supplies, the actual printing, the automated addressing and the postage. That said, we have changed our sidebar masthead to read NAAR BULLETIN VOLUNTEERS.

Let me tell you how grateful we are for those of you in the directory. When we receive notification of a retiree passing to the Silent Majority, usually all that is reported is the name; hopefully, the age; and date of death. At least with the directory, we can identify the division from which the deceased retired, year of retirement and years of service. We know that many of you worked on classified projects and you could not discuss your work with family members. However, now might be a good time to jot down a few facts so that the "kids" will know what dad (or mom) did at the old "Rock Pile" to pay for the braces on their teeth, to help them through college or to buy their first home.

At the end of July, I was invited by the City of Downey to take a tour of the Downey facility with an author writing a book about Gus Grissom. I was sorry I went. The place has been gutted, littered and, in places, flooded with rain water. There is no power, so you walk along darkened hallways. Everything that appeared to have any historical value was dumped in Building 14, helter-skelter. I have always had a special feeling about Downey because that was where I spent most of my professional life. It was a very sad visit!

Once again we bring you a bevy of wonderful stories about airplanes and the people that were responsible for their creation and/or their operation. Our writers are simply fantastic and we attribute any success we may have to the quality of the articles and stories they bring to this volunteer publication.

Until our next issue, may God smile on everything you do! May He go with you!

LAST CALL FOR THE 2ND ANNUAL B-1 REUNION LUNCHEON
SATURDAY, SEPTEMBER 20, 2003 — 12:00 NOON TO 4:00 PM
GOLDEN SAILS HOTEL IN LONG BEACH, CALIFORNIA
CALL LEE FRENCH (562) 866-9435 OR LYNN ISOMOTO (562) 496-5604

"GOOD LUCK, MR. GORSKY!"

On July 20, 1969, as commander of Apollo 11, Neil Armstrong was the first man to set foot on the moon. His first words after stepping on the moon, "That's one small step for man, one giant leap for mankind" were televised to Earth and heard by millions. But just before he reentered the lunar module, he made the enigmatic remark, "Good Luck, Mr. Gorsky!" Many people at NASA thought it was a casual remark in reference to some rival Soviet cosmonaut. However, in checking later, there was no one with that name in either the Russian or American space programs.

Over the years, many people questioned Armstrong as to what the statement meant, but Armstrong always just smiled and gave no explanation. On July 5, 1995, in Tampa Bay, Florida, while answering questions following a speech, a reporter again brought up the 26-year old question. This time, Armstrong responded. That Mr. Gorsky had died, so Armstrong felt he could answer the question.

In 1938, when he was growing up in Wapaughcaughneta, Ohio, he was playing baseball with a friend in his back yard. The friend hit the ball into his neighbors' yard by the bedroom windows. Armstrong entered the yard to get the ball. His neighbors were Mr. and Mrs. Gorsky. As he leaned down to pick up the ball, young Armstrong heard Mrs. Gorsky shouting at Mr. Gorsky, "Sex! You want sex? You'll get sex when the kid next door walks on the moon!"

NAA/ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Bill Kelley at (714) 637-9374.

The Antelope Valley Retirees Club meets in the South Meeting Room of the Palmdale Culture Center at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell/Boeing retirees are welcome. For information, contact Bill "Tiny" Kisler at (661) 273-0213.

Boeing Valley Retirees Club meets on the 3rd Thursday of each month at the Canoga Park Rec Center, 8500 Fallbrook Avenue, Canoga Park, CA. The president is Jennie Muncaster at (818) 341-8919.

"The Old LAD Stress Group" meets for breakfast approximately every two months at Mimi's Café in Torrance, CA. If you are from the old LAD Stress Group contact Gene Laxton at (310) 378-3113 or Ed Rosenthal at (310) 375-8933.

"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meet at 11:30 AM on the 2nd Wednesday of the month for lunch at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd. and Mariposa Ave.

The NAA 101 Tooling Retirees Group meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at the Cimarron Café, 5160 190th St., west of Anza Avenue in Torrance, CA.

GPS Breakfast Club meets from 6:00 AM to 8:00 AM every Wednesday at the Primrose Restaurant, corner Seal Beach Blvd. and Westminster Blvd. All are invited. For more information, call Fred Shitara at (714) 750-1016.

Seal Beach Retirees Group meets at 11:30 AM on the 3rd Wednesday of the month at "The Fish Co." on Los Alamitos Blvd. at Katella Avenue. For more information call Marvin Blaski at (714) 848-5717 or e-mail to mblaski@aol.com.

The Facilities, Industrial Engineering and Plant Services Retirees Group meets at 11:45 AM on the 2nd Thursday of each month at Buster's (formerly Jolly Roger's) Restaurant in the Long Beach Marina. Contact Joe W. Mausser at (562) 596-5845.

Downey Engineering Group of Retirees known as the "Choir Boys" meets every Thursday for lunch at various restaurants from Downey to Seal Beach. Call Al Risi at (714) 892-5725 for meeting location.

"Ye Olde Pharts Breakfast Club" meets at 10:00 AM on the 4th Thursday each month for breakfast at Polly's Pies at 2025 N. Tustin Avenue in Orange. For information call Don Metzger at (949) 495-5374.

The North American Rockwell Retiree Club of McAlester, OK (a satellite of Tulsa, OK) meets at 10:30 AM on the 3rd Tuesday in March, June, September and December at the Down Town Meeting Place. Call J.A. Darden at (918) 423-0706 for more information.

Tulsa & McAlester Retirees meet for breakfast at 8:00 AM on the 2nd Monday in March, June, September and December at the Ramada Inn, 8181 East Skelly Drive in Tulsa, OK. Call Harry Phillips at (918) 838-3716.

The North American Rockwell Retirees Group of Columbus, OH Engineers and Professionals meet at 11:30 AM on the 3rd Thursday of each month at the Berwick Park House. Contact Byron C. Solomides at (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH meets at Noon on the 1st Monday of the month at the Whitehall Community Park on North Hamilton Road in Whitehall. Contact E. Hamilton at (740) 927-5940 for information.

Autonetics Group including Marine Systems, Program Office, Project Office, System Test, Engineers and Designers meets for lunch on the last Wednesday of each month at the HomeTown Buffet, Rose Avenue and Alta Vista Drive in Placentia, CA. Call Mike Vohs at (714) 762-1925 for more details.

Autonetics Industrial Engineering and Maintenance Retirees meet for lunch on the 1st Thursday of each month at the HomeTown Buffet, 390 McKinley, located in front of the Home Depot, in Corona, CA. For more details, call Don Burt at (909) 698-0072.

Autonetics Flight Control Retirees meet at 11:30 AM on the 3rd Thursday of each month except December at "The Lamppost Pizza House" located at 17568 Yorba Linda Blvd., corner of Richfield Road, in Yorba Linda, CA. Call Jim Anderson at (714) 779-5620 for details.

Autonetics Retirees meet for lunch at 11:45 AM on the 2nd Wednesday of every month at the Rembrandt Restaurant, 909 E. Yorba Linda Blvd., Placentia, CA. All Autonetics retirees, spouses and friends are invited. Contact Robert Nease at (714) 971-7870 or e-mail to *rfnease@email.msn.com* or Ed Venanzi at (714) 779-5652 or e-mail to *EdVennz@aol.com*.

A Group of NAA Retirees meets for breakfast at 8:15 AM on the 1st Wednesday of each month at Knott's Berry Farm – Chicken Restaurant. All are cordially invited. Contact Maxine Haun at *maxi3131@aol.com*.

Autonetics Financial Luncheon Group meets for lunch at Noon on the last Wednesday of the month at Carrow's located at 100 N. State College in Fullerton. Contact Ken Cantwell at (714) 970-7171 or *Kcantwell@prodigy.net*.

A Group of Engineer Mgt. meets at 11:30 AM on the 3rd Tuesday of the month for lunch at Denny's on Imperial Hwy. and the 57 Fwy. Call Ed Moran at (562) 697-9949 for information.

NAA Tech Reps Assn. (TRA) Breakfast Club meets at 9:00 AM on the 1st Tuesday of each month at the Carlsbad Airport Restaurant. For more information, call El Presidente Rafael Colunga at (760) 940-0525.

Material Group Retirees from Downey and Seal Beach meet at 11:30 AM on the 4th Wednesday every month at the Stox Restaurant at Imperial Hwy. and Clark Ave. in Downey. Contact Marian Nielson at (562) 429-1020 or Joan Dominguez at (562) 865-7200 or e-mail to *tatedom@aol.com* for information.

ANNUAL EVENTS

B-1 Program Annual Reunion – The 2nd annual reunion luncheon will be held at the Golden Sails Hotel, 6285 E. Pacific Coast Highway in Long Beach, CA on Saturday, September 20, 2003 from 12:00 Noon to 4:00 PM. All B-1ers are invited. Contact Lee French at (562) 866-9435 or Lynn Isomoto at (562) 496-5604.

Bald Eagle Reunion – The 42nd Annual Reunion will be held on Saturday, April 17, 2004 at the Proud Bird Restaurant. Call Val Yarbrough at (805) 646-2283.

The Hangar Gang – This group of retirees meets approximately every 6 months. For time, date and other details, call Gene Salvay at (818) 788-3974 or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

Flight Test Instrumentation Annual Reunion – This group of retirees meets annually at the Fullerton Elks Club. For information, call Frank Vigil at (562) 691-0236.

Tech Rep Association Picnic – A group of retired Field Service Technical Representatives has a yearly picnic in June at a park in Fallbrook, CA. For more information, call TRA President Rafael Colunga at (760) 940-0525 or e-mail to *rafael@nctimes.net*.

The Annual M&P, P.D.L., "Friends Christmas Luncheon" – This group of retirees and employees haw assembled in mid-December for a festive luncheon and gabfest for the past 19 years. Those wishing to participate and receive notice of the next December luncheon, call Fred Koeller at (310) 545-8854.

To have your group or function listed in the CALENDAR OF EVENTS, please send the information to the NAA Retirees Bulletin including identification of the group, date(s) of the event, location including address and name of contact with phone number and e-mail. Send to NAA Retirees Bulletin, 2600 Westminster Blvd., P.O. Box 3644, M/C SJ51, Seal Beach, CA 90740.

A Ghost From The Distant Past

by Lowell Ford and Morgan "Mac" Blair

In the summer of 1981, an article written by Jeffery Ethell appeared in the highly respected and semi-official AIR FORCE Magazine, alleging that the famous P-51 Mustang was not an NAA design at all, but, rather, one that Lee Atwood purchased from Curtiss-Wright for $56,000, then added a laminar flow wing and claimed it as NAA's own. The accusation was reiterated in a subsequent book by Ethell.

The story went: *"It must be stressed that these were not as has been so often reported, the P-40 data... The NAA team had used the basic XP-46 data and incorporated them in an aircraft with a laminar flow wing"*. To support the story, Ethell quoted the highly regarded head of the Air Corps Fighter Branch, Lt. Ben Kelsey, as saying, *"This was our* ***secret talk*** *in the halls (of Wright Field) to get the P-46 in place of the P-40,* ***after Gen. Arnold turned down the P-46"***.

This "story" was the result of Ethell's search for an explanation to the perplexing question of the Mustang's short incubation period. But, in reaching his answer to that incredulous *"100 day legend"*, he created a new legend that was **completely false**, although repeated in subsequent works by reputable aviation writers and accepted as fact by some historians.

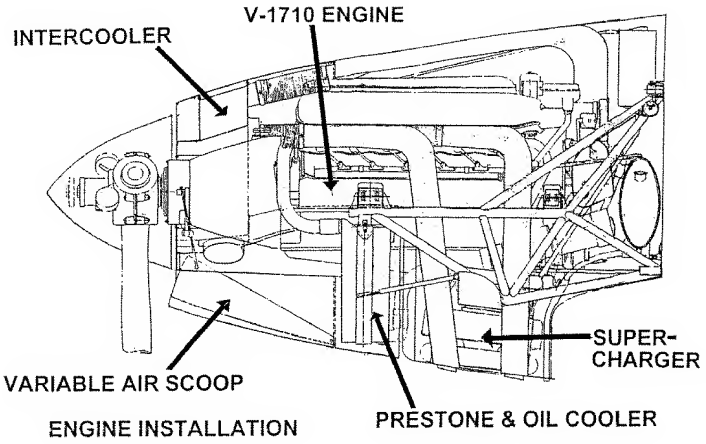
While Ethell satisfied his concern about the "implausibly" short time quoted to *"design a perfect Mustang from scratch"*, his presumed answer involving the XP-46 is **definitely not true**. It offered a rational of how the Mustang **might have been** created in such a short time. And, like Genesis, it implied that nothing existed and then in 120 days there it was. Of course, that is not true, nor is the implication that the Mustang "came out of the box" perfectly balanced.

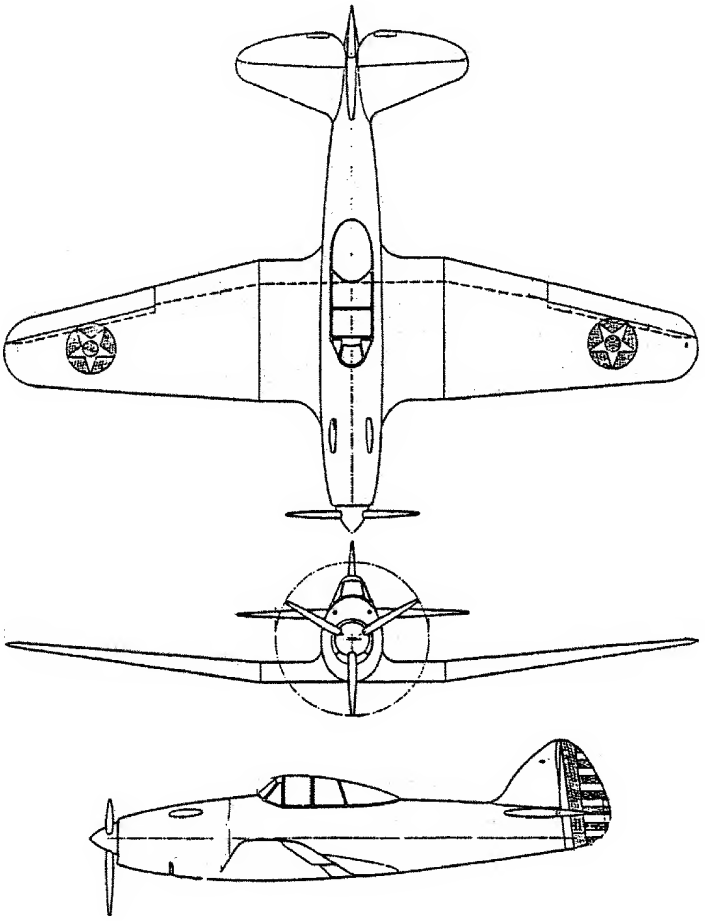
The original design was advanced and very sound. But the difference between the NA-73X prototype that first flew on October 26. 1940 and the Merlin powered Mustangs of 1944-1945 that overpowered the German Luftwaffe was immense. This could only have been achieved with the unique NAA joint engineering/manufacturing system which permitted continuous development of important design changes to be incorporated efficiently into the process without upsetting the rate of production.

Ethell has made some strong allegations. But now is the time to clear the air and the airplane of these grossly misleading charges.

As NAA Chief Engineer in Dundalk, Maryland, Lee Atwood developed a strong conviction in the superiority of liquid cooled in-line engines, believing they would produce a cleaner design with higher performance than the air-cooled radials using the efficient low drag NACA cowlings. He chose the 1,000 hp, 12 cylinder in-line liquid cooled V-1710 engine in development by the Allison Division of General Motors for the NAA entry in the Air Corps pursuit competition of 1935. Since the Allison was designed to be used with a turbo supercharger, his cooling system design used a uniquely shaped intercooler radiator located below and around the nose of the engine with a conventional radiator for engine cooling. This minimized any increase in frontal area. However, before the proposal could be submitted, the competition was cancelled as an obsolete concept.

Further study of the liquid-cooled engine went onto the back burner when, on September 28, 1935, the Air Corps announced that NAA had won its first major contract for 42 BT-9 trainers. The next day, Dutch Kindelberger went to California and leased a 20 acre tract of bean fields adjoining Mines Field (now LAX)





1935 XP
TWO PLACE PURSUIT

Drawings from the Lowell Ford Collection

Three-view drawing and inboard profile of the engine installation showing the key features of the Lee Atwood design for the 1935 two place pursuit plane competition.

for an annual rent of $600. With the move from Dundalk to Inglewood completed, production of the trainer and the O-47 observation plane began in earnest.

This required many new buildings and it soon became a major operation, ultimately providing military trainers not only for the U.S. but for countries around the world. The first large order was for 200 Harvards for the British ordered by the Anglo-French Purchasing Commission located in New York, followed by 230 Yale trainers for the French.

The Purchasing Commission was engaged in talks with all of the major U.S. aircraft manufacturers about buying existing designs. The P-40 was the only fighter airplane even close to quantity production and having just won the pursuit competition, Curtiss was overwhelmed with the largest order for aircraft since World War I.

With the excellent relationship established with NAA on the Harvard, the Commission approached Kindelberger to become a second source for the P-40. Dutch did not think it was practical to convert the P-40 from Curtiss production methods to the radically different and much more efficient NAA system of *high rate line manufacturing*. Neither was he enthusiastic about building an airplane that was not even competitive with the existing German fighter, the Messerschmitt Bf-109.

Earlier, Lee's interest in liquid cooling systems was rekindled by a technical report by Dr. F.W. Meredith, a member of Britain's Royal Aeronautical Establishment in Farnborough, England. Although not widely recognized at first, Meredith's publication in 1936 of a paper entitled *"Notes on the cooling of aircraft engines with special reference to ethylene glycol radiators enclosed in ducts"* offered the intriguing possibility of obtaining thrust, rather than drag, from a properly designed radiator system. This concept later became famous as the Meredith Effect. Lee brought this to the attention of Ed Horkey and Edgar Schmued and suggested its incorporation in their advanced fighter study.

In January 1940, when the British again pressed NAA to build the P-40, Lee Atwood countered with the idea of a totally new fighter. This would be a clear departure from the mission of the BPC to purchase production aircraft with modifications only in armament and equipment to meet British requirements. In the early discussions, Lee had no design drawings and offered only one technical representation, the British originated Meredith Effect.

While Lee was in the East, Horkey and Schmued, making significant progress on the new fighter design including the adaptation of the laminar flow wing, had evolved the design into a proposal for a new fighter. Dutch assured the Commission that it could be produced in the same time required to convert the P-40 to the more efficient NAA production methods. These methods had been introduced and proven under the guidance of Ralph Ruud with the BT-9/Harvard trainer programs and the British needed no further convincing. This NAA proposal was submitted on **March 11, 1940**.

After several weeks, Sir Henry Self, the head of the British Purchasing Commission, called Lee and indicated that a contract probably could be worked out and suggested two things. To quote Lee:

"First, since we had never built a first line fighter airplane that I attempt to get the aero and cooling data on the P-40 and, secondly, that I propose a suggested letter contract for his consideration. I called Burdette Wright at Curtiss at once and he agreed to talk to me the next day—so I took the night train to Buffalo and met him in his office".

Lee continued,

"I offered to buy the P-40 data, and, of course, told him why. We talked most of the day and by taking into account the costs of wind tunnel and flight test programs for the XP-37, XP-40 and the XP-46, he arrived at a payment of $56,000. I accepted with a handshake and left that afternoon, ***April 11, 1940****. I sent the agreed upon money to him on* ***May 21, 1940*** *and he sent the data sometime later."*

Sir Henry, relying on NAA's integrity and best effort and fully realizing that buying an undeveloped model was risky and a clear departure from his mandate, sent a letter on **April 11, 1940** advising of their *"intention to purchase 400 North American Model NA-50B single-seat fighter aeroplanes fitted with the Allison CV-1710 engines and three bladed metal propellers all in accordance with North American Specification No. 1592 as finally altered and amended and agreed upon."*

Unaware of the agreements between NAA and the British Purchasing Commission, the Air Corps was briefing General Hap Arnold on the proposed Curtiss Foreign Release Agreement involving substitution of the P-46 for the P-40. Apparently, the Air Corps and Curtiss were planning on NAA to serve as a second source to produce the P-46. Arnold turned the plan down.

The Air Corps learned of the NAA proposed design, North American NA-50B, when the request for approval of the Foreign Release Agreement was submitted to the War Department. The Air Corps immediately requested that NAA provide technical information on the NA-50B and NAA quickly responded on **April 24, 1940** by submitting NA Specification No. 1620 which included a three-view drawing of the XP-51, a separate document from the original British NA Specification No. 1592 and the final British Specification No. 1623 for the NA-73. The release was granted with the proviso that two airplanes from the British production line, Nos. 4 and 10, would be made available to the Air Corps at no cost to the government. On **May 29, 1940** the RAF signed the official contract for 300 NA-73 aircraft.

Just 102 days *from the contract signing*, the prototype NA-73X was rolled out of the experimental shop, complete but without the engine. Neither Allison nor the Air Corps had taken Ed Schmued's 100 day schedule seriously, believing it was unrealistic and could not be done!

Somewhat ironically, on the same day that the Foreign Release Agreement was approved for the NA-73X, the Air Corps Review Board had completed its evaluation of the RFD R40-C proposals. This was a highly classified competition for advanced and high speed fighter designs, to which NAA was not invited because Material Command deemed NAA strictly a trainer, medium bomber and observation plane manufacturer. The three airplanes recommended by the Review Board to be procured as prototypes were the Vultee XP-54, Curtiss XP-55 and the Northrop XP-56. These never resulted in further development but they did absorb all of the Air Corps' fighter funds planned for 150 P-51s.

A Ghost From The Distant Past

(continued on page 6)

A Ghost From The Distant Past

(continued from page 5)

In August 1940, the first production B-25 was rolled out and two months later, on October 26, 1940, the NA-73X Mustang prototype made its first flight.

When the Curtiss XP-46 flew later the following year, it was found to be slower than the P-40 it was to replace and the program was cancelled.

As Lee Atwood indicated, "It took great insight, courage and trust on the part of Sir Henry and his technical staff in deciding to go outside the assigned role of the BPC and choose a new design, which became the Mustang." Sir Henry also had to consider the point of view of the Air Ministry that had been expecting a second source production contract for P-40s and who had no exposure to the study and evaluation made by his staff of the NAA proposal. He needed to present a procurement rationale for a fighter similar to the P-40 but with better performance. It was for this reason that he placed emphasis on Lee obtaining the P-40 design data which he believed would provide an acceptable basis for London's approval.

In a letter to Air Commodore Baker who had headed up Sir Henry's Staff and was now back in England, Dutch wrote in October 1941:

"It seems a little ironic that we bought the information from Curtiss which we were unable to use and now are giving them the information that we have obtained ourselves in order that they can make their laminar flow job successful."

We thank authors Ford and Blair for this outstanding insight and clarification of one episode in the history of the famous P-51 Mustang. We look forward to the completion of their joint manuscript and subsequent publication covering the NAA advanced fighter studies of the mid-1930s through the development of the Merlin powered Mustangs that enabled the 8th Air Force to annihilate the German Luftwaffe. Both authors reflect a wealth of hands-on historical knowledge and we are certain they will continue to favor us with some great aviation stories in future issues.



Photo from the Lowell Ford Collection

The NA-73X Mustang made its maiden flight in October 1940 and was replaced by AG345 and AG347 after a successful flight test program.

The T-2C Buckeye Trainer Final Days



U.S. Navy photo

With the final carrier qualification landing conducted by Training Squadron 9, NAS Meridian, MS in July of this year, the brilliant saga of the Buckeye trainer in U.S. Navy service draws to an end. In 1956, the Navy ordered the aircraft, known then as the T2J-1 from the NAA Columbus Division. To optimize unit cost, the FJ-1 Fury fighter wing shape and the T-28C trainer control system, with hydraulic boost added, were incorporated into the design.

After 217 of the T2J-1s, powered, by a single 3,400-pound thrust Westinghouse J34-W-36 were built, the Navy took delivery of 97 of the T2J-2s powered by twin 3,000-pound thrust Pratt & Whitney J60-PW-6 turbojets. The Navy redesignated the two versions as the T-2A and the T-2B. In 1968, the Navy ordered 231 of the T-2Cs powered by two 2,950-pound thrust General Electric J85-GE-4 turbojets. For many Navy pilots, the Buckeye represented the first jet flight, the first night flight and the first trip to a carrier. The T-45 Goshawk will replace the Buckeye.

A Mustang Goes Farther With A Little Polish

RAF No. 309 (Polish) Army Cooperation Squadron was formed on 7 October 1940 at Renfrew, near Glasgow, to support the Polish troops training in Scotland. It was equipped with 12 Westland Lysanders, one Percival Proctor and two Tiger Moths. In April 1942, the squadron began to refit with North American P-51 Mustang I fighter-reconnaissance aircraft.

From the moment of his first flight in a Mustang on 30 April 1942, F/O (Lt.) Janusz Lewkowicz fell in love with the airplane and became fascinated with its capabilities. A graduate of the Warsaw Technical University, he approached the NAA representative in London and obtained an analysis of the Mustang's fuel consumption at most favorable boost pressure and airscrew-rotation speed settings for various altitudes and speeds.

Thinking about a most spectacular way of demonstrating the Mustang's range, he became captivated by the idea of a fighter sweep from Scotland to Norway. He started his own studies and produced petrol consumption/range calculations, graphs and navigational charts. These were put to practical tests during various exercises by the No. 309 pilots, which fully verified his theoretical calculations.

At the end of June, Lewkowicz forwarded his proposals for the Norway sweep, backed by the results of his research, to HQ No. 71 Group. There was no response. In a desperate attempt to prove the feasibility of his proposals, he decided to put them to the test without authorization.

His chance came on 27 September 1942 when he obtained permission for a long-range navigational flight over the North Sea from Dalcross (which was some 100 miles further from Norway than Peterhead, the most suitable airfield for such a sortie). He took off at 1005 hours, heading for Stavanger, Norway. One hundred miles from the Norwegian coast he dropped down to wave top level. He made a low-level sweep over Stavanger Bay and the town itself, strafing a few targets of opportunity. He intended to land at Peterhead, but veered off course and landed at Dunino at 1350 hours.

Meanwhile, there was consternation at Dalcross when he became "overdue". Checking the Operations Book, it was found that Lewkowicz had noted "Rhubarb to the Stavanger area". Upon landing, he was placed under house arrest, severely reprimanded and then congratulated. The range of Mustangs operational sorties was increased in October 1942.

In June 1943, No. 309 Squadron (Polish), fully equipped with Mustang Is, was transferred to No. 12 Group of Fighter Command.

This Mustang I vignette was drawn from The Polish Air Force At War—The Official History - 1939-1943 by Jerzy Cynk. Mr. Cynk is a noted writer, historian and authority on Polish Aviation. During World War II, he served in the Polish Underground until he was captured in 1943 and sent to Auschwitz Concentration Camp. He was moved to several other camps and was liberated in May 1945 near Salzburg, Austria. He moved to England, married and now resides there with his wife.



Photo from the NAA RB Photo Files

A Mustang I, S/N RAF AG348, similar to the one flown by F/O (Lt.) Janusz Lewkowicz in his singular attack on the coast of Norway to demonstrate the extended range capability of the aircraft. All Polish aircraft in the RAF were distinguished by a small PAF red and white checkerboard insignia forward of the cockpit.

Looking Back!

In 1953, USAF Intelligence was scouring the world to obtain information on Soviet modern aircraft when, on 5 March 1953, a Polish defector, Lt. Franciszek Jarecki, took off from the Polish Air Force Base at Slupsk in a MiG-15bis and streaked to Ronne Airfield on the Swedish island of Bornholm. Western specialists examined the plane and a few days later returned it to Poland. Jarecki came to the USA and provided a first hand account of Soviet aircraft and tactics. He joined North American Aviation as an engineer and later went on to form his own company.

Jacqueline Cochran - The Fastest Lady In The World

By Dr. Raymond L Puffer, Historian
Air Force Flight Test Center, Edwards AFB

By any standards, Jacqueline Cochran had an amazing career. Born in the remote swampy reaches of northern Florida, probably in 1912, she never really knew who her parents were. Barefoot and unschooled, she was raised by a family friend in total poverty until as a young teenager, she apprenticed herself to a hairdresser. From that unpromising beginning, she developed a chain of beauty shops and launched a personally owned and hugely profitable cosmetic empire.

She learned to fly in order to get to business meetings, and soon became passionate about it. Wealthy and intensely competitive by nature, she found herself with the means and the will to begin some really serious flying. With a second-hand Travel Air biplane and the same fierce determination that she had for everything else, "Jackie" Cochran set out to make herself a force to reckon with in the aviation world.

Her first air race was a woman's pylon race in 1933, which turned out to be the only all-female race she ever entered. Jackie always claimed afterwards that she "...never wanted women's records ...mixed up with the men's records I was after." She preferred open competitions thereafter but, ironically, a great many of her subsequent triumphs were women's records. Other races followed, other airplanes, and many aviation "firsts".

In 1938, she set a new world speed record in a civilianized Seversky P-35 fighter, the predecessor of the P-47 Thunderbolt. With her growing number of contacts in the aviation industry, she began to field-test new aviation engines. When World War II engulfed the nation, she was convinced that women could be just as skillful as men in the air, and that women could make a strong contribution to the war effort.

She boldly exploited her friendship with General H. H. "Hap" Arnold, Chief of the Army Air Corps, and made herself the first woman to fly a bomber across the North Atlantic Ocean. She organized and trained a small cadre of female pilots, absorbed competing groups, and ended up building and commanding the famed Woman's Airforce Service Pilots (WASP).

The air races and world records continued after the war, including the World Absolute Speed Record in a highly modified P-51C Mustang in 1947. Then, in the early 1950s, Jackie grew concerned that the jet age was passing her by. All of the American jet aircraft were owned by the military, and it was nearly impossible for a woman to wrangle a ride in one, much less to fly it. Shamelessly pulling strings, she got herself hired as a consultant by Canadair, then just beginning to build an advanced version of the F-86 Sabre with a powerful Orenda turbojet engine.

From there, she only had to arrange for Canadair to evaluate the new aircraft at Edwards AFB, and to have herself designated as the test pilot. As a final touch, she built a 100-kilometer, 12 leg course on the Rogers Dry Lakebed for the official timing. She later donated it to the Air Force, where it was subsequently used for a number of record attempts.

Major "Chuck" Yeager drew the assignment of checking Jackie out in the F-86, and then flying chase during her record attempts. They set to work at once. Cochran was a superb pilot and her transition to jet aircraft was rapid. Not that the process always went smoothly. When she appeared on the flight line 90 minutes late for her first sortie, Yeager gave her a counseling session that she never forgot. Flying ability was the only way to win Yeager's esteem and it was not long before he felt genuine respect for her cockpit skills.

After five orientation sorties, Jackie felt comfortable in the Sabre. On May 18, 1953, just 50 years ago, she blazed around the course at an altitude of 300 ft. and established a new closed course women's world speed record of 652.337 mph. She proceeded then to set another official speed record the following week over a 500-kilometer course at a speed of 580 mph.

To cap off the project, Yeager lead her up to 45,000 feet and told her to push over into a vertical dive. He followed her down and together they laid down a tremendous sonic boom, as Jackie became the first woman in the world to exceed the



Photo courtesy of the AFFTC History Office

The singular Canadair CL-13 Sabre Mark 4, RCAF S/N 19200, in which Jacqueline Cochran became the first woman to exceed the speed of sound on May 18, 1953.



Photo courtesy of the AFFTC Hstory Office

Chuck Yeager and Jacqueline Cochran savoring the moment of achievement after establishing the speed record.

speed of sound. For these feats, Jacqueline Cochran became the first woman to be awarded the Gold Medal of the Federation Aeronautique Internationale. Both she and Yeager won the Harmon International Trophy for 1953, and the two superb pilots went on to become lifelong friends.

Editor's Note: On June 3, 1964, Jackie flew twice the speed of sound in a Lockheed F-104G Starfighter. She died in Indio, California on August 9, 1980. In her lifetime, she held more distance and speed records than any pilot living or dead, man or woman. That record will never be broken. From a barefoot girl stealing chickens to a decorated pilot mingling with kings, queens, presidents, pashas and premiers; Jacqueline Cochran was truly a very unique and awe inspiring American. In 1997, the U.S. Post Office issued a stamp in her honor.



NORTH AMERICAN AVIATION F-107A by WILLIAM J. SIMONE

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Keeping The Hun In The Sun

by Tom Mackin

In the Winter 2002 issue of the NAA RETIREES BULLETIN, Tom gave us a wonderful inside view as a docent at the Smithsonian's National Air & Space Museum. He joined NAA in 1950 as a field service rep and worked at several locations on the F-86 Sabre, including an 18-month assignment in Germany on the F-86K. In 1954, he moved on to the F-100.

In February 1954, I was in beautiful, cold and snowy Minneapolis, Minnesota working with the 18th Fighter Interceptor Squadron flying Columbus-built F-86Fs. One day the phone rang and it was my boss, John Casey, telling me to pack and return to LAD to go through the new F-100A Technical Representative School.

Having received a lot of information about the new plane, making the move to sunny California was a very welcome event. Being one of the first to be selected to work on the first fighter that could achieve Mach 1 in level flight also made me feel good!

Upon arrival in California, I was informed that on completion of the Tech Rep course, I was to accompany the first F-100 to be delivered to Edwards AFB and assist in the Phase 4 Performance tests. The school was very comprehensive and I found that the F-100A "Hun" was not a very complicated machine. The various systems were very much like the ones on the F-86. It was their position and location in the airplane that varied. One new task was to learn how to pack and install the drag chute in the rear fuselage. So, one day in June 1954, I was on my way to Edwards.

The airplane to be used in the test program was the seventh off the production line. The NAA testing was conducted at the "North Base" and most of it was performed by company pilots. Although testing went smoothly, several problems were encountered. The drag chute compartment was under the engine at the very rear of the fuselage. If the afterburner was used above 30,000 feet; upon landing and deployment of the chute, ashes came out of the compartment. This was easily corrected by installing a small pipe into the compartment to supply outside cooling air.

I was not directly responsible for the performance of the airplane. My job was to assist the Air Force crews in keeping the airplane flying. As the tests went on, the Air Force test people became very critical about the performance and handling of the airplane. In fact, a group went to Wright-Patterson AFB with a recommendation to hold up the F-100 program until corrections were made to the aircraft handling characteristics. Upon landing in Ohio, the story went, they were astounded to read in the local newspaper that the Air Force had signed a contract to purchase a number of F-100As.

Upon completion of the Phase Four test program, I was transferred to George Air Force Base in Victorville, California where the 479th Day Fighter Squadron of the Tactical Air Command was to receive delivery of the first F-100As. The Air Force was somewhat behind in training on the F-100; therefore, I was joined by four additional F-100 training personnel. We set up a school to train both pilots and maintenance people. With the help of the LAD field service school, we were able to do a credible job.



Photo from the John Henderson Collection

USAF F-100 Super Sabre units stationed in various NATO bases in Europe deployed their fighters to Wheelus AFB, Tripoli in Africa for gunnery training and pilot upgrading.

Delivery of the first airplanes was scheduled for October 1, 1954, just 16 months from the first flight of the YF-100. A large ceremony was arranged for the delivery. Local political figures were invited and all base personnel were on the flight line. TV coverage for the event was extensive.

In the early afternoon, three F-100s appeared out of the West. The day was warm and the air was bumpy. Led by the Group Commander, the aircraft made several low passes over the field and appeared to prepare for landing. Suddenly! The Commander's plane began to porpoise in what was called a JC maneuver. "Holy smoke", I thought, "We are going to lose the first F-100 in the first delivery flight!" The Colonel pulled up in a climb and landed with no problem. He scared a whole bunch of people and had a sore neck when he hit his head on the canopy. He also saved an NAA Rep from having a heart attack!

Deliveries continued until the squadron had a total of 17 airplanes. Everything went well for a couple of weeks until one of the pilots landed and called me over to his airplane. His problem occurred as he was dog-fighting with an F-86—he lost control of the F-100. It was apparent that he had experienced "inertial coupling" caused by the torque of the engine compressor and a lack of longitudinal control in the F-100. We had no further instances of this issue at George AFB. But a very tragic event did occur at Edwards AFB.

There, George Welch was killed when his airplane broke up because of the same problem. The Air Force immediately grounded all F-100As and moved them to Palmdale to remedy the problem. The vertical tail surface was increased 27%, the wings were extended another twelve inches and modifications to the controls were incorporated.

There was no further need for F-100 NAA Reps at George AFB, so we all returned to LAD. I was offered an assignment on the F-86K in Germany. And, of course, I was ready to go. But that is another story.

When I returned from Germany in the late summer of 1956, I had missed the F-100Cs but there were still plenty of As around and the Ds were coming off the line. The Air Force had opened an F-100A school at Nellis AFB in Nevada where all new pilots were given their checkout. They had over a hundred F-100As in the school and were having serious maintenance problems. The Air Force contracted NAA for a group of people to move to Nellis and help them. I was selected to handle the administration in Los Angeles and when I asked John Casey what was my role, the answer was, "Just keep Col. Grumbles happy."

We did keep the Colonel happy and in a few weeks most of the planes were flying. The program was so successful, the Air Force contracted for groups of five specialists to go to each F-100D squadron and help them with their problems. I was the administrator of these groups and since most Tactical Air Force units were located in the South, I spent many days in that part of the country.

In April 1957, I was sent to Langley AFB in Hampton, Virginia, the home of Tactical Air Force Headquarters. My assignment was to help them with their problems and to keep LAD aware of the performance of the F-100s and what improvements were needed. There were a lot of problems!

The F-100Ds and Fs were equipped with a Sunstrand built "Constant Speed Drive" to provide direct power to the electronics on the airplane. The drive used lubricating oil from the engine. Unfortunately, the drive's body would split and in seconds the engine oil was gone, the engine froze and the airplane was lost! As you can imagine, TAC was very unhappy. After much negotiating, it was opted to install a small tank in the engine compartment to provide the oil for the drive.

There was the question as to where the modification should take place. TAC did not want to send all the airplanes back to California. The Air Force had built a large hangar at Seymour Johnson AFB in Goldsboro, North Carolina and at the time it was not being used. It was agreed to use this facility to install the Constant Speed Drive tank and to equip the airplanes with nonskid brakes. NAA moved 100 people to Goldsboro and TAC scheduled the airplanes as needed. The project went smoothly. It was completed on time and, as I learned later, under the original contract cost. Needless to say, TAC was very pleased with the effort.

Another unfortunate happening plagued the F-100D which caused many accidents and fatalities. Months were spent trying to determine the cause and only by chance did we discover the culprit. During takeoffs, there would be an explosion in the engine compartment shortly after liftoff. The explosion would cut the flexible hydraulic lines to the horizontal stabilizer and, in most cases, the pilot lost control at an altitude too low for successful ejection.

Cooling air for the F-100's engine compartment was directed from the rear during startup and into the takeoff up to a certain airspeed. As the airspeed increased, the cooling moved forward until the airspeed attained 275 knots, when all cooling came from the forward duct. However, during this process, there was a null period where no air was entering the engine compartment, and it was at this moment that the explosions occurred. There was no fuel or other explosive materials in the compartment. So, why the explosions?

Many hours were spent searching for the cause. One day, I sat in a meeting with a general and several colonels trying to decide if the pilots should make steep takeoffs to achieve altitude for a safer ejection in case of an explosion or to stay close to the ground to get through the null point as fast as possible.

Then came the answer to the cause of the problem! Two airmen at Warner Robins AFB in Georgia were checking out an engine with the aft section of the airplane removed. They lit the afterburner and one of them ducked under the engine. Suddenly, he felt a spray of fuel hit him! It turned out that the fuel for the afterburner went through small metal lines and just before going into the engine, it went through a "pigtail" device that allowed the metal lines to expand as the heat built up. Investigation discovered that the "pigtail" was cracking and spraying fuel into the very hot engine compartment. With sufficient fuel buildup during the null period, explosion could occur. The airplanes were all grounded and remedial action was taken.

One more F-100 story and I shall pass the baton. I was at TAC Headquarters and things were not going well that day. TAC had lost another airplane. The Commander was very unhappy and his unhappiness trickled down to me. So, on the way home I stopped at the Officers Club Bar for some libation. A colonel whom I did not know sat down beside me and said, "You look a little beat up". I explained to him who I was and related that day's events. He responded, "Hey! I am the commander of an F-100 group down south and it is a great airplane". "Colonel", I said, "the next one is on me and North American".

Tom currently resides in Bethesda, Maryland with his charming wife, Millie.

F-100 Super Sabre – The Versatile "Hun"

by Erik Simonsen

Affectionately known as the "Hun" for hundred, the North American Aviation F-100 Super Sabre holds a special legacy in aviation. As the first member of the "Century Series" of fighters, the F-100 led the way in the development of technologies that would heavily influence the next generation of high performance fighters. On May 25, 1953, veteran test pilot George Welch lifted the YF-100A off Roger Dry Lake at Edwards AFB and quickly went Mach 1.

Breaking the sound barrier on a first flight was just one of the many firsts for the F-100. The Super Sabre would become the operational fighter to routinely fly supersonic as well as establish the first supersonic speed record of 755.149 mph at low altitude.

North American Aviation originally conceived the F-100 (NA-188 or Sabre 45) as an air superiority fighter to counter envisioned Soviet fighters. Yet history proved the F-100 more effective in the ground attack role. As deliveries to the Air Force began in September 1954, under certain flight conditions directional instability problems became evident in the fleet. Increasing the size of the vertical stabilizer by 27 percent and the wing span by 26 inches alleviated that anomaly and production was resumed.

During the mid-1960s, a version of the F-100 specifically modified to counter enemy air defenses was developed. The first "Wild Weasel" two-seater F-100F was deployed in Vietnam to deal with the new and more sophisticated Soviet-built surface-to-air missiles (SAMs). The Hun also carried out very effective ground attack missions, and if needed during the Cold War, Super Sabres were equipped to carry nuclear weapons.



Photo from the Erik Simonsen Collection

The F-100F during a test flight. The two-seater later evolved into the first "Wild Weasel" SEAD (Suppression of Enemy Air Defenses) aircraft.

A recipient of the coveted Collier Trophy in 1953, the F-100 served with the USAF until June 1972 and the Air National Guard until November 1979. A total of 2,292 F-100s of all models were produced for the U.S. and foreign military customers.

Erik has become a regular contributor to the NAA RETIREES BULLETIN for which we are truly grateful. The communications manager for Boeing Air Force Systems, he is an avid aviation photographer specializing in creative photographic techniques to illustrate aircraft and spacecraft. His work has appeared in numerous books, publications and advertisements as well as in two aviation books he authored.



Photo from the Erik Simonsen Collection

Camouflaged Michigan ANG F-100D visiting Homestead AFB in Florida in the early 1970s. With a wingspan of 38 ft. 9 in., a length of 47 ft. and a maximum takeoff weight of 34,832 pounds, the "D" was the most widely produced variant with 1,274 built.



Photo from the Erik Simonsen Collection

The North American F-100C Super Sabre near George AFB, California in the early 1950s.

CONGRATULATIONS and BEST WISHES to

Don Murphy of Torrance, California for National Recognition on the 50th Anniversary of the Cub Scout Pinewood Derby which he created because his son was too young for the Soapbox Derby.

June Sadero for being chosen as the "Senior Citizen of the Year" by the City of El Segundo, California for her outstanding service to the community.

Jerry and Esther Funk of Paonia, Colorado on their 60th Wedding Anniversary.

The Silent Majority

by Stan Guzy



Soon after retirement to Cedar Ridge, California, Bob Kalbach lost his wife and his health deteriorated until he was wheelchair bound. However, he never lost his dignity or his sense of humor. Being a space cover collector, he issued his own last day of issue cover postmarked on the day of his passing. We will miss you, Bob!

ALSTON, JAMES E., 79 – died on June 29, 2003 in Lilburn, GA after suffering a heart attack brought on by complications from cancer. He had been paymaster at the LA Division and retired after 21 years of service. He is survived by his wife of 16 years, Frieda and a daughter, Francis.

BACA, OLIVER V., 76 – of Westminster, CA died on June 30, 2003 of unspecified causes. He had been a computer technician at NAA/RI before retiring.

BARTON, WILLIAM P., 84 – died in Lancaster, CA on June 19, 2003. He had been a manufacturing manager on the B-1B program and retired in 1988 after 36 years of service. He is survived by his wife of 62 years, Bert.

BEAN, AL, 75 – passed away on July 16, 2003 in Long Beach, CA from a cancerous brain tumor diagnosed in December 2002. He had worked as a Project Manager on the Space Shuttle program at the Downey facility before he retired in 1984 after 32 years of service. Al owned a sailboat and sailed as far as Australia and several other voyages to Mexico and Catalina from his mooring in Los Alamitos Marina. Al is survived by his son, Mike, and a loving companion, Ann Tack.

BENNETT, BETTY J., 76 – died on June 17, 2003 at the Inland Valley Medical Center in Murrietta, CA. Betty retired as an executive secretary at Autonetics and went on to obtain an MA degree in Fine Arts.

BOEDING, ROBERT J., 73 – died August 2, 2003 from complications following the removal of a non-malignant brain tumor in May 2003. After military service in Korea, he went to Kansas State University, receiving a degree in electrical engineering in 1959. He was hired by NAA in Downey, CA and later transferred to the Autonetics facility. He retired from NAA/RI in 1990.

BROSIUS, RODNEY R., 77 – died at Memorial Hermann Hospital in Katy, TX on May 30, 2003. He retired in 1986 after 33 years of service as an engineering design supervisor and then moved to Pearlblossom, CA. Rodney is survived by his wife, Gloria.

BROWN, THOMAS L., 69 – of Anaheim, CA died May 11, 2003 of congestive heart failure. He had worked as an electrical engineer for RI before he retired. Tom is survived by his wife, Jan.

COLEMAN, JOHN W., 88 – died April 22, 2003 in Riverside, CA of unspecified causes. He had worked as a model maker for Rocketdyne in Canoga Park, CA before he retired. He is survived by his wife of 50 years, Sara.

DEAN, DOUGLAS, 89 – passed away May 28, 2003 after a long illness. He had retired from NAA and had achieved recognition as a skilled artist in the Morro Bay art community. He had been very active in civic affairs and Rotary Club activities. He will be missed by his wife of 64 years, Lillian.

DEMARCHI, ERNEST N. "ERNIE", 64 – passed away on June 28, 2003 in Mission Viejo, CA from complications due to cancer. After receiving a degree in mechanical engineering Ernie was hired by NAA in 1962. He worked on the Apollo electrical systems, providing mission support for every Apollo mission. He went on to the Shuttle and "Star Wars" programs where he was named Chief Engineer and Program Manager, receiving many citations and awards recognizing his technical and managerial achievements. He retired in 2002 after a distinguished career. Ernie is survived by his wife, Sheri and his first wife, Carolyn.

DODRILL, ARTHUR E., 79 – died July 18, 2003 at Miravilla Health Care Center in Cherry Valley, CA of undisclosed causes. He had been an electrical engineer for NAA/RI for 20 years before he retired. Art is survived by his wife, Chris.

DORSSEY, LEON A., 84 – died on May 22, 2003 of natural causes at the Lifecare Center in Reno, NV. He worked as a welding instructor and was a member of the NAA Rod and Gun Club. After retiring in 1978, he moved to Cold Springs, NV.

EMGE, CHARLES M., 78 – died July 13, 2003 of undisclosed causes. He retired from NAA/RI after 40 dedicated years of service as an industrial electrician and was the Chief Steward in the I.B.E.W. He is survived by his wife of 53 years, Joan.

FLEMING, WILLIAM F., "BILL", 64 – passed away on June 26, 2003 due to complications from surgery. Bill worked on all facets of the Space Program and was an Associate Program Director when he retired after 37 years of service. He was very active in his church and in scouting and will be sorely missed. Bill is survived by his loving wife, Kelli.

FOSTER, ARTHUR M., 83 – died on June 27, 2003 at Green Hospital in La Jolla, CA after a six year battle with cancer. He suffered a heart attack after undergoing a week of chemotherapy. He had been a contract negotiator for NAA/RI and retired after 31 years of service. He is survived by his wife of 59 years, Marie.

GARING, GERALD E., "JERRY", 72 – of La Luz, NM, died on May 29, 2003. Jerry retired in 1990 after 28 years of service as a project engineer on the Apollo and Space Shuttle projects at the Downey facility. He is survived by his wife, Charlene.

GATHAS, JR., WILLLAM C., "BILL", 75 – of Anaheim, CA, died on June 24, 2003. Bill retired from Downey in 1990 after almost 20 years of service.

GIESEY, JACK H., 84 – passed away on June 17, 2003 in Westminster, CA of pneumonia. He was a retired electronics engineer. He is survived by his wife, Earline.

GIBSON III, WINFIELD S., COL. 81 – of Encino, CA, died of pulmonary fibrosis on June 26, 2003. After a distinguished career in the USAF, he achieved high standards as a professional engineer on the Space Shuttle project at NAA/RI. He is survived by his wife, Jessma.

Silent Majority
(continued on page 14)

Silent Majority

(continued from page 13)

GONZALES, LUCRETIA A., 68 – passed away on August 3, 2003, losing her life to a lung disorder. She had worked at Autonetics for ten years. She is survived by her husband, Rudy.

GRIFFIN, ERVA J., 80 – passed away on March 16, 2003 of cancer at her home in Irvine, CA. Jane retired from NAA/RI in 1984 after service in Security and Shuttle engineering departments.

HANEY, WILLIAM B., 74 – died May 29, 2003 at his home in Moorpark, CA surrounded by his loving family. He had retired from NAA/RI as a welding engineer and was very active in local civic groups and clubs. He is survived by his wife, Mary Ann.

HENDERSON, CHARLES L., 77 – passed away on May 11, 2003 in Riverside, CA of undisclosed causes. He had worked at NAA/RI as a missile operations engineer.

HINKLE, GERALD "JERE", 72 – died August 12, 2003 of causes yet to be determined. He was an aerospace engineer for NAA/RI before he retired. He is survived by his wife, Mary.

HOGUE, KEN, 72 – passed away in Battle Ground, WA on July 24, 2003 of unspecified causes. Ken had retired from the B-1B division where he served as the support equipment project manager for Intermediate Automatic Test Equipment (IATE) and the Test Program Set (TPS) in support of the B-1B avionics test activity. He also worked on the C-130 Gun Ship until he retired.

HUMESTON, GEORGE E., 79 – passed away on June 6, 2003 in Santa Ana, CA. George retired in 1984 as a logistics engineer after 29 years of service. George is survived by his wife, Barbara.

JACOBSON, ROBERT H., "JAKE", 78 – died on March 15, 2003 in the Veterans Nursing Home at Sheridan, WY. After leaving the service in 1945, Jake received a degree at the Univ. of Minnesota and in 1948 joined the aerodynamics engineering group at NAA/LAD. He was recalled to the USAF in 1951 and served in various assignments including Japan, the Test Pilot School at Edwards AFB, U-2 missions and Thailand during the Vietnam War. He retired from the service as a Lt. Colonel at Wright Patterson AFB. He returned to RI on the B-1 Flight Test Program. He is survived by his wife, Bonnie, and his first wife, Virginia.

JAMES, LAUREL M., 74 – died at her daughter's home in San Diego, CA on June 29, 2003. She worked as an engineering analyst at Autonetics for 25 years before retiring in 1992. She is survived by her husband, Delmar.

KALBACH, ROBERT B., "BOB", 77 – died on June 22, 2003 at his home in Grass Valley, CA. Bob worked in Engineering Flight Test, Santa Susanna and Edwards AFB on the X-15 and, later, on the Apollo and Space Shuttle programs.

LUM, ERNEST K., 86 – died on October 7, 2002, a victim of cancer. He had retired in 1982 from NAA/RI Strategic Systems Division after 27 years of service as an electrical engineer. He is survived by his wife of 55 years, Fannie.

LYON, ROBERT B., 82 – died June 4, 2003 at his home in Wildomar, CA of undisclosed causes. He had served in the USAF meritoriously for 24 years and achieved the rank of Lt. Colonel. He worked for NAA/RI until he retired. He is survived by his wife of 61 years, Gladys.

MAKI, KURT E., 51 – died on June 22, 2003 in Hawaii of unspecified causes. He had worked at RI in Anaheim, CA as a facilities engineer.

MILLER, LAWRENCE J., – late of Whittier, CA, passed away in July 2003. Date of passing and cause of death were not specified, but information indicated he had been a 30 year employee of RI. He is survived by his wife, Sara.

MUSSELMAN, JAMES E., 77 – passed away on July 21, 2003 at his home in Fullerton, CA of unspecified causes. Jim served as a contracts manager for RI before he retired in 1987. He is survived by his wife of 36 years, Susan.

NEALY, ROBERT L., 68 – passed away at his home in Garden Grove, CA from complications resulting from cancer. Bob retired from Autonetics as Director of Operation, Quality Control in 1996 after 36 years of service. He leaves his loving wife, Miki.

ONTIVEROS, PETE C., 80 – of La Habra, CA died on May 27, 2003. After graduating from the University of Houston in 1948, he joined NAA participating in the development of the Inertial Navigation System for nuclear submarines and the test programs for the Apollo and the Space Shuttle flight control systems. Pete retired in 1984 after 32 years of service. He is survived by his wife, Carmen.

OESTREICH, KENNETH T., 86 – died on June 30, 2003 at his home in Sun City, CA. Ken was a marketing supervisor at NAA/RI for 33 years.

PECHTER, LARRY, 68 – died on June 22, 2003 of undisclosed causes. He worked at Autonetics as a guidance and control engineer before retiring in 1993. He is survived by his wife, Harriet.

PHELAN, JOHN H., 81 – of Laguna Woods, CA, died on June 27, 2003 of aortic dissection. He is survived by his wife, Rita.

REED, JAMES R., 75 – an Autonetics design engineer, he died of a heart attack brought on by a fall and a broken hip on June 10, 2003 in Irvine, CA. He is survived by his wife, Shirley.

SHAW, DAN L. "DANNY", 78 – passed away on January 10, 2003 from complications of a stroke that occurred in July 1999. Danny retired from LAD as an engine lathe machine lead man after 39 years of service. He resided in Redondo Beach, CA with his wife of 56 years, Addie Lou.

SCHOENHEIT, ESTHER G., 76 – died July 7, 2003 at her home in Fallbrook, CA after a long battle with lung cancer. She had been employed at NAA/LAD in the Wind Tunnel and Flight Test departments in the 60s and 70s. She is survived by her husband of 45 years, Al.

SLAGG, WILLIAM R., 84 – passed away on May 29, 2003 after a brief illness. Bill moved to Southern California in 1939 and spent his career as an aeronautical engineer with NAA until he retired in 1983. He is survived by his wife of 61 years, Bettie.

SLATER, HERBERT A., 74 – died July 9, 2003 after suffering several years with muscular dystrophy and diabetes. He has been an aeronautical engineer at NAA/RI and served as a technical representative for RI to the USAF in Germany and the Philippines.

SUGGS, CONSUELO "CONNIE", 76 – died July 24, 2003 of congestive heart failure in Washougal, WA. Formerly of Orange, CA she had retired from Rockwell Corp. She is survived by her husband Robert.

SUTHERLAND, LOUISE, 71 – died of cancer on July 19, 2003. She had been a secretary at RI prior to retirement. Louise is survived by her husband, James.

TAGGART, ED, 73 – died on June 6, 2003 in Texarkana, TX. He retired from RI in 1987 after 34 years of service and moved back to De Queen, AR.

TOSTENSON, DON O., 87 – died on May 23, 2003 in Nipomo, CA of complications from a broken hip. In 1947, Don transitioned from Vultee to NAA as a design engineer on the Navaho, Hounddog, B-1 and S-II projects. After 30 years of service, he retired in 1978 as the Director of S-II Administration.

Silent Majority

(continued on page 15)

Contrails From The Past

by Ed Rusinek

Dear Ed,

I really appreciate the historical articles that appear in the NAA RETIREE BULLETIN. However, since I have been receiving the publication only for the past two years, I don't know if the following subject has ever been discussed. I am enclosing a photo to go with the story.

How many remember that in the late 1950s, NAA successfully demonstrated a rocket propelled F-86? The rocket was not designed as a JATO (jet assisted takeoff) bottle but was to provide the F-86 with supersonic dash capability at altitude. The rocket was developed by Aerojet and was propelled by a mixture of Unsymmetrical Dimethyl Hydrazine (UDMH) as fuel and Red Fuming Nitric Acid (RFNA) as the oxidizer.

The nitric acid was rumored to be hard on a person's organs, so those of us working close to the aircraft were instructed to drink a quart of skim milk in case we came in contact with the oxidizer fumes.

To the best of my recollection, J. O. Roberts was the test pilot and we flew only one test flight.

— Clarence H. Bauer, Cape Canaveral, FL



Photo courtesy of Clarence H. Bauer

Ed's Resp.: I never heard of this event during my watch! But, stories like yours make all this effort worthwhile!

Shuttle Mockup In Downey To Be Moved

The 100-foot long mock-up of the Space Shuttle located in the DEI room at the Downey facility will be temporarily moved to another location on the site. The move has been requested by the Industrial Realty Group which plans to develop a 73-acre movie studio there.

Declaring the mock-up to be a unique artifact, the City of Downey stated that the structure will eventually become part of the city's planned Columbia Memorial Space Science Learning Center. In addition to the studio, the city redevelopment plan includes a 34-acre shopping center, a 30-acre Kaiser Permanente medical center, a 10-acre park and a 2-acre space museum.



NASA photo

Silent Majority

(continued from page 14)

TREMAN, SALVATORE M., "SAM", 90 – died on July 22, 2003 at his home in Hemet, CA of unspecified causes. During WWII he was assistant chief engineer at Bell Aircraft. He also worked for Republic Aviation, Curtiss-Wright and finally, NAA where he was chief engineer on the Apollo project.

VOGELSANG, EDWARD W., – of Buena Park, CA, passed away August 5, 2003 of unspecified causes. He has been an electronic engineer for NAA/RI before retiring. He is survived by his wife, Jo.

WHITE, DUANE, 72 – passed away on May 21, 2003 due to complications resulting from cancer and a heart condition. Duane retired in 1982 after 30 years of service as a Graphics Presentation Specialist. He began his career at Rocketdyne, was transferred to Corporate (El Segundo), then to the B-1 division and later to Corporate (Pittsburgh) where he performed a variety of graphics functions for the Rockwell family.

ZELLER, JACK W., 72 – passed away on April 25, 2003 shortly after a third heart surgery. Jack had retired in 1990 after 39 years of service as a jig bore machinist at LAD.

PAX DOMINI SIT SEMPER VOBISCUM

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Photo from the Lowell Ford Collection

The rollout of the first production North American Aviation B-25 Medium Bomber in August 1940 was attended by William S. Knudsen, General H. H. "Hap" Arnold and James H. "Dutch" Kindleberger.

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION
Retirees Bulletin

Winter 2003

Wishing you a Holiday Season filled with Peace and Joy

Inside: **THE SAGA OF RB-25D "3374"** by Norm Avery
APOLLO 13 – THE REST OF THE STORY by Thomas Barrera
NAA TECHS IN WAR AND PEACE by John Casey
HIGH SCHOOL JUNIOR RECEIVES COVETED "SNOOPY" by Don Thompson

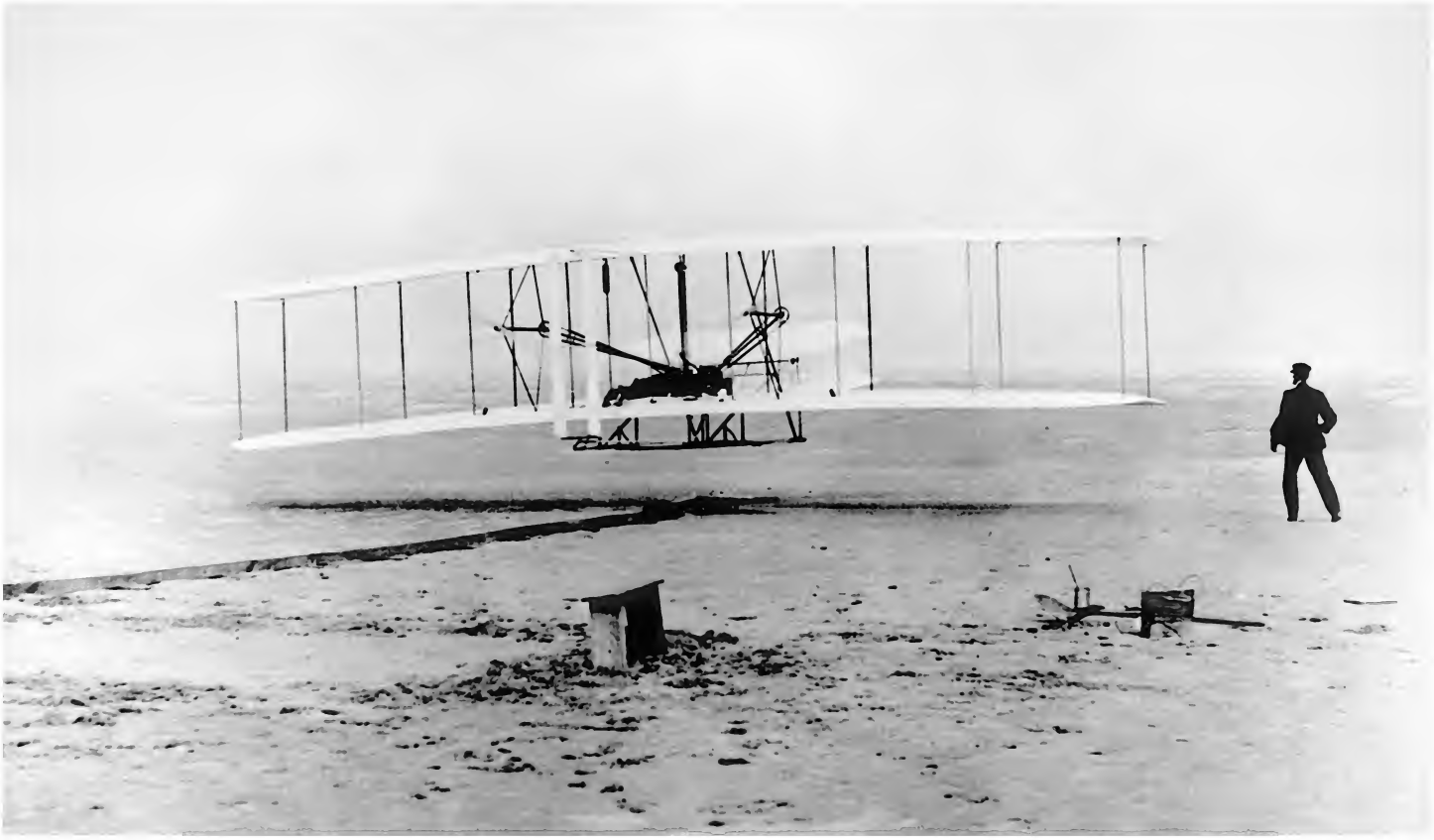


Photo courtesy of the AFFTC History Office

ON A CHILLY, WINDSWEPT BEACH AT KITTY HAWK, NORTH CAROLINA, ORVILLE WRIGHT INAUGURATED THE AVIATION AGE ON DECEMBER 17, 1903 WITH THE WORLD'S FIRST SUCCESSFUL HEAVIER-THAN-AIR FLIGHT IN THE WRIGHT *FLYER*, COVERING A DISTANCE OF 120 FEET AND LASTING 12 SECONDS.

NORTH AMERICAN AVIATION
Retirees Bulletin

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DEAR NAA RETIREE BULLETIN SUBSCRIBER

With this issue, our current staff of volunteers has completed two years of yeoman service. I cannot express enough my gratitude and appreciation for the splendid effort they have put forth. I must also recognize the wonderful group of retirees that have emerged to relate their fascinating experiences and accomplishments as members of the NAA team. The same must be said for the aviation historians that continue to support us with stories and photographs. And, finally, I must include you many readers that have repeatedly provided us encouragement along with your financial support.

At this time of celebration and recognition of the 100th Anniversary of the Wright Brothers and their magnificent flight, I cannot help but reflect in pride and sadness. In pride, because I had the privilege of working most of my adult life with the finest company and people in history. Yes, there were other great aviation and aerospace companies but none had the brilliance, flair and panache of North American Aviation. It seemed like nothing was impossible. If it didn't exist, we invented it and did it ON SCHEDULE! As the dreamers put their ideas to paper, others with mastery of their hands converted them into fantastic machines. In sadness, because this company called North American Aviation rose up in the middle of the Great Depression to build America's finest aircraft and spacecraft on Earth, in Space and on the Moon only to fade into the pages of history as a footnote of the industry.

This being the final issue for the year 2003, we must once again solicit your support if your subscription ends with this issue. Sonnie Robertson has sent out reminders and so many of you have responded that she is still incorporating the stack of letters and checks. There will be no further reminders so if you have put this task aside to do later, perhaps now is a good time to do it.

In this issue, we bring back our House Historian, Norm Avery, with another splendid story about the B-25. A new writer with a spectacular report about the Apollo 13 near-disaster, Tom Barrera, provides us with an intimate look at the events leading up to the LOX tank explosion and its impact on the mission. The man responsible for NAA tech reps spread out all over the world for many, many years, John Casey, talks about some of the people that joined his team of stalwart individuals. Finally, we have Don Thompson telling as about a very extraordinary high school junior, his daughter.

Every year at this time, we review the list of people that have joined the Silent Majority. This past year has been devastating in the toll it has taken of our friends and colleagues. We know that all of us are in the sunset years of our lives but there is no need to rush into darkness. It is very easy to fall into a state of depression where nothing seems to matter anymore. Do not let this happen to you! Do not give up! Stay the course and fight like HELL to stay alive!

In this holiday season, may we close with part of an old Irish Blessing!

May God fill your heart
With gladness to cheer you.
May God guard you
Through each night and day
And ever watch above you.

THE IMPORTANCE OF STAYING FOCUSED

The USS Constitution, affectionately called *"Old Ironsides"*, as a combat vessel carried 48,600 gallons of fresh water for her crew of 475 officers and men. This was sufficient to last six months of sustained operations at sea. She carried no evaporators (fresh water distillers).

According to her log, "On 27 July 1798, the USS Constitution sailed from Boston with a full complement of 475 officers and men, 48,600 gallons of fresh water, 7,400 cannon shot, 11,600 pounds of black powder and 79,400 gallons of rum." Her mission: "To destroy and harass English shipping."

Making Jamaica on 6 October 1798, she took on 826 pounds of flour and 68,300 gallons of rum. Then she headed for the Azores, arriving there 12 November. She provisioned with 550 pounds of beef and 64,300 gallons of Portuguese wine. On 18 November, she set sail for England.

In the ensuing days, she defeated five British men-of-war and captured and scuttled 12 English merchantmen, salvaging only the rum aboard. By 26 January 1799, her powder and shot were exhausted. Nevertheless, though unarmed, she made a night raid up the Firth of Clyde in Scotland. Her landing party captured a whiskey distillery and transferred 40,000 gallons of single malt Scotch aboard by dawn. Then she headed home.

The USS Constitution arrived in Boston on 20 February 1799 with no cannon shot, no food, no powder, no rum, no wine, no whiskey and **38,000 gallons of stagnant water.**

NAA/ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Bill Kelley at (714) 637-9374.

The Antelope Valley Retirees Club meets in the South Meeting Room of the Palmdale Culture Center at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell/Boeing retirees are welcome. For information, contact Bill "Tiny" Kisler at (661) 273-0213.

Boeing Valley Retirees Club meets on the 3rd Thursday of each month at the Canoga Park Rec Center, 8500 Fallbrook Avenue, Canoga Park, CA. The president is Jennie Muncaster at (818) 341-8919.

"The Old LAD Stress Group" meets for breakfast approximately every two months at Mimi's Café in Torrance, CA. If you are from the old LAD Stress Group contact Gene Laxton at (310) 378-3113 or Ed Rosenthal at (310) 375-8933.

"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meet at 11:30 AM on the 2nd Wednesday of the month for lunch at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd. and Mariposa Ave.

The NAA 101 Tooling Retirees Group meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at the Cimarron Café, 5160 190th St., West of Anza Avenue in Torrance, CA.

GPS Breakfast Club meets from 6:00 AM to 8:00 AM every Wednesday at the Primrose Restaurant, corner Seal Beach Blvd. and Westminster Blvd. All are invited. For more information, call Fred Shitara at (714) 750-1016.

Seal Beach Retirees Group meets at 11:30 AM on the 3rd Wednesday of the month at "The Fish Co." on Los Alamitos Blvd. at Katella Avenue. For more information call Marvin Blaski at (714) 848-5717 or e-mail to *mblaski@aol.com*.

The Facilities, Industrial Engineering and Plant Services Retirees Group meets at 11:45 AM on the 2nd Thursday of each month at Buster's (formerly Jolly Roger's) Restaurant in the Long Beach Marina. Contact Joe W. Mausser at (562) 596-5845.

Downey Engineering Group of Retirees known as the "Choir Boys" meets every Thursday for lunch at various restaurants from Downey to Seal Beach. Call Al Risi at (714) 892-5725 for meeting location.

"Ye Olde Pharts Breakfast Club" meets at 10:00 AM on the 4th Thursday each month for breakfast at Polly's Pies at 2025 N. Tustin Avenue in Orange. For information call Don Metzger at (949) 495-5374.

The North American Rockwell Retiree Club of McAlester, OK (a satellite of Tulsa, OK) meets at 10:30 AM on the 3rd Tuesday in March, June, September and December at the Down Town Meeting Place. Call J. A. Darden at (918) 423-0706 for more information.

Tulsa & McAlester Retirees meet for breakfast at 8:00 AM on the 2nd Monday in March, June, September and December at the Ramada Inn, 8181 East Skelly Drive in Tulsa, OK. Call Harry Phillips at (918) 838-3716.

The North American Rockwell Retirees Group of Columbus, OH Engineers and professionals meet at 11:30 AM on the 3rd Thursday of each month at the Berwick Park House. Contact Byron C. Solomides at (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH meets at Noon on the 1st Monday of the month at the Whitehall Community Park on North Hamilton Road in Whitehall. Contact E. Hamilton at (740) 927-5940 for information.

Autonetics Group including Marine Systems, Program Office, Project Office, System Test, Engineers and Designers meets for lunch on the last Wednesday of each month at the HomeTown Buffet, Rose Avenue and Alta Vista Drive in Placentia, CA. Call Mike Vohs at (714) 762-1925 for more details.

Autonetics Industrial Engineering and Maintenance Retirees meet for lunch on the 1st Thursday of each month at the HomeTown Buffet, 390 McKinley, located in front of the Home Depot, in Corona, CA. For more details, call Don Burt at (909) 698-0072.

Autonetics Flight Control Retirees meet at 11:30 AM on the 3rd Thursday of each month except in December at The Lamppost Pizza House located at 17568 Yorba Linda Blvd., corner of Richfield Road, in Yorba Linda, CA. Call Jim Anderson at (714) 779-5620 for details.

Autonetics Retirees meet for lunch at 11:45 AM on the 2nd Wednesday of every month at the Rembrandt Restaurant, 909 E. Yorba Linda Blvd., Placentia, CA. All Autonetics retirees, spouses and friends are invited. Contact Robert Nease at (714) 971-7870 or e-mail to *rfnease@email.msn.com* or Ed Venanzi at (714) 779-5652 or e-mail to *EdVennz@aol.com*.

A Group of NAA Retirees meets for breakfast at 8:15 AM on the 1st Wednesday of each month at Knott's Berry Farm-Chicken Restaurant. All are cordially invited. Contact Maxine Haun at *maxi3131@aol.com*.

Autonetics Financial Luncheon Group meets for lunch at Noon on the last Wednesday of the month at Carrow's located at 100 N. State College in Fullerton. Contact Ken Cantwell at (714) 970-7171 or *Kcantwell@prodigy.net*.

A Group of Engineering Mgt. meets at 11:30 AM on the 3rd Tuesday of the month for lunch at Denny's on Imperial Hwy. and the 57 Fwy. Call Ed Moran at (562) 697-9949 for information.

NAA Tech Reps Assn. (TRA) Breakfast Club meets at 9:00 AM on the 1st Tuesday of each month at the Carlsbad Airport Restaurant. For more information, call El Presidente Rafael Colunga at (760) 940-0525.

Material Group retirees from Downey and Seal Beach meet at 11:30 AM on the 4th Wednesday every month at the Stox Restaurant at Imperial Hwy. and Bellflower Blvd. in Downey. Contact Marian Nielson at (562) 429-1020 or Joan Dominguez at (562) 865-7200 or e-mail to *tatedom@aol.com* for information.

Rockwell Vandenberg AFB Retirees Breakfast Club meets at 8:45 AM on the 2nd Tuesday of each month at the IHOP restaurant in Santa Maria. Contact Marv Bailey at (805) 929-6652 or Al Finley at (805) 937-3690.

ANNUAL EVENT

Bald Eagle 42nd Annual Reunion – will be held on Saturday, April 17, 2004 at the Proud Bird Restaurant. Call Val Yarbrough at (805) 646-2283.

The Hangar Gang – meets at the Proud Bird approximately every 4 months. For time, date and other details, call Gene Salvay at (818) 788-3974 or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

Flight Test Instrumentation Annual Reunion – meets annually at the Fullerton Elks Club. For information, call Frank Vigil at (562) 691-0236.

Tech Rep Association Picnic – A group of retired Field Service Technical Representatives has a yearly picnic in June at a park in Fallbrook, CA. For more information, call TRA President Rafael Colunga at (760) 940-0525 or e-mail to *rafael@nctimes.net*.

The Annual M&P, P.D.L., "Friends Christmas Luncheon" – This group of retirees and employees have assembled in mid-December for a festive luncheon and gabfest for the past 20 years. Those wishing to participate and receive notice of the next December luncheon, call Fred Koeller at (310) 545-8854.

NAA-K B-25 Reunion – will be held on Sunday, August 15, 2004 from 1:00 PM to 5:00 PM at the Wyandotte County Museum in Bonner Springs, KS. For more information, call Harry J. Desko at (913) 287-7223 or write to him at 3024 N. 47th St., Kansas City, KS 66104.

Grants Pass 25th Anniversary Picnic – will be held on Wednesday, September 8, 2004. Contact Bob Morse for details at (541) 474-1438 or e-mail to *Lindabob@internetcds.com*.

NAA Flying Horsemen will hold their reunion on Friday through Sunday, September 17–19, 2004 at the Eskaton Lodge in Grass Valley, CA. Contact Harry Shapiro at (714) 993-3496, fax (714) 993-1208 or e-mail *shapsplace@aol.com*.

To have your group or function listed in the CALENDAR OF EVENTS, please send the information to the NAA Retirees Bulletin including identification of the group, date(s) of the event, location including address and name of contact with phone number and e-mail. Send to NAA Retirees Bulletin, 2600 Westminster Blvd., P.O. Box 3644, M/C SJS1, Seal Beach, CA 90740.

The Saga Of RB-25D "3374"

By Norm Avery

In 1957, the Pentagon decided to honor General James H. Doolittle by providing a replica of the B-25 he flew in the raid on Tokyo in April 1942. After serving as the centerpiece at the Tokyo Raiders reunion in Las Vegas in April 1958, the airplane would be placed in the USAF Museum at Wright-Patterson AFB in Dayton, Ohio.

No identical B-25B was found to exist, so efforts were made to locate a B-25C or B-25D in airworthy or restorable to airworthy condition. Finally, RB-25D A/C No. 43-3374 was located in storage at Davis-Monthan AFB in Arizona which met the requirements for restoration. The USAF issued authorization for the airplane to be restored as much as possible to replicate the one flown by Doolittle in the Tokyo raid. North American Aviation in Inglewood, California was contracted to accomplish the task.

Personnel at Davis-Monthan prepared a one flight only certification to ferry the airplane to LAD where it arrived in February 1958. The identity of the ferry pilots is unknown but they probably were from the NAA staff as it was more expedient than waiting for an Air Force crew to be assigned. The airplane was then dropped from USAF inventory and transferred to the museum.

The service record of "3374" warrants mention. It was one of 1,090 B-25Ds built at Kansas City and was first accepted on October 29, 1943. The Kansas City Modification Center replaced the bombardier's greenhouse nose with a special nose to accommodate three cameras of a trimetrogon system for aerial mapping. It was then designated as a RB-25D/F-10.

In January 1944, it was assigned to the 91st Photo Mapping Squadron at Reading AFB, Pennsylvania and later to Buckley Field in Colorado before being ferried to Talara, Peru. The F-10s of the 91st mapped several hundred thousands of square miles of previously uncharted land from Panama to the southern regions of Chile, another story in itself. In November 1944, the airplane was returned to the United States and assigned service with technical training units and Military Air Transport Service. In September 1957, it was placed in storage in the "bone yard" at Davis-Monthan AFB to await the scrapper or surplus sales.



Photo from the Norm Avery Collection

B-25D/F-10, Aircraft No. 43-3374, at Davis-Monthan AFB in Arizona with the three camera tri-metrogon nose which LAD replaced with a standard "greenhouse".



Photo from the Norm Avery Collection

B-25D/F-10, Aircraft No. 43-3374, after restoration as Aircraft No. 40-2344 on acceptance flight off Catalina Island prior to delivery to the 1958 Doolittle Raider reunion at Las Vegas.

I found information about the F-10s to be quite elusive. In time, I located two retired colonels in Arizona that flew them with the 91st Mapping Squadron in South America. Both generously loaned me their precious photos and supplied some interesting accounts. Colonel Ole C. Griffith was quite astonished to discover that "3374" was the airplane he photographed at Buckley Field before flying it to Peru and then to find "his" airplane in the USAF museum.

The statement of work provided to North American Aviation called for deletion of the tail gun canopy and its replacement by two fake tail guns. The waist gun windows were to be skinned over and a standard greenhouse nose installed. A great number of smaller items were removed and many others added. In 1958, many B-25 parts were still in inventory or could otherwise be located. When completed, the only visible difference between Doolittle's original plane and "3374" was the exhaust system. The plane was appropriately painted and renumbered "02344", Doolittle's aircraft tail number. NAA was also to provide any necessary preventive maintenance and perform acceptance flights.

All mechanical work was done by the Field Service Department and all the engineering by the Engineering Modification Group under Duncan Harding with Raider Colonel Jack Sims serving as the liaison officer. When completed, the plane was test flown by both Sims and Travis Hoover.

On about April 14, 1958, Sims flew the airplane to Nellis AFB at Las Vegas and met with Captain Richard Sadorf and his crew who were assigned the responsibility of getting the plane from Nellis to McCarran Airport and on to the Tropicana Hotel. It was Sadorf's assignment to scout the route and make arrangements with the airport authority and police escort.

Apollo 13 – The Rest Of The Story

By Thomas Barrera

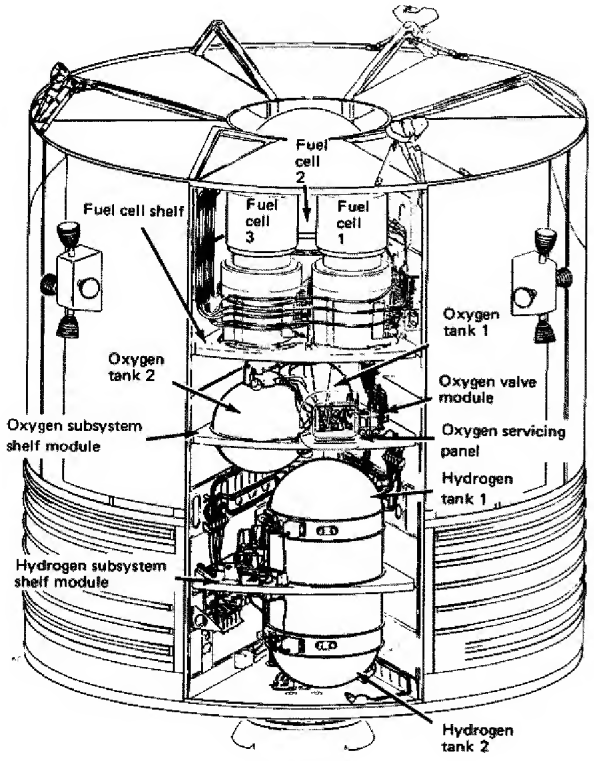
The Apollo 13 mission has been extensively documented in several documentary films, one major motion picture and a number of books. The focus has been on the events initiated by the words *"Houston, we've got a problem."* from the Apollo 13 crew to Mission Control in Houston. However, the events prior to the launch of Apollo 13 that set the stage for the problem have received little attention. This article examines those events as related to liquid oxygen tank (LOX) #2 that led to a near disaster aboard Apollo 13 on the evening of April 13, 1970.

Prior to Apollo 13, there were eight flights of which six were manned. The first two flights were unmanned and were in support of Saturn launch vehicle. The manned flights consisted of one earth orbital flight, followed by one deep space flight and four missions to the moon, two of which landed (Apollo 11 and 12) and then returned safely to earth. Each of these vehicles carried electrical power systems of the same design as Apollo 13, i.e. fuel cells, liquid oxygen tanks and liquid hydrogen tanks. A total of fourteen oxygen tanks were flown on these prior missions.

So the question was, what was the difference that caused catastrophic failure of Apollo 13 LOX tank #2 which resulted in loss of the remaining LOX tank and complete loss of fuel cell power and breathing oxygen?

Electrical power to the Apollo Command and Service Modules (CSM) was provided by three fuel cells utilizing oxygen and hydrogen as reactants. Liquid oxygen and hydrogen were stored in vacuum insulated tanks installed on modular shelves in Sector IV of the Service Module. The two LOX tanks, identified as Tanks #1 and #2, also supplied breathing oxygen to the crew.

The LOX was stored at -279°F and pressure that maintained the fluid in a supercritical state. This meant that a liquid level did not exist and the fluid was homogeneous, that is, the density was equal throughout the tank. However, the effects of zero gravity could cause the fluid to stratify or develop layers and/or zones of warmer and colder fluid which could cause pressure collapse when mixed.



An isometric view of the equipment providing Electrical Power located in Sector IV of the Apollo Service Module.

Two fans were incorporated into the design to periodically stir the fluid and prevent severe stratification resulting in loss of pressure. Operating pressure was maintained by using heaters automatically controlled by pressure sensors which were turned on when the pressure dropped to the low end of the operating band and off when the pressure increased to the upper end of the operating band. During pre-launch operations, after the tanks were filled, the heaters were operated by using a ground system power supply that could deliver up to

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The plan was to tow the airplane to the Tropicana. However, some news people wanted photos with the engines running which prompted the idea to taxiing the airplane along the highway under its own power.

On April 20, 1958 the morning after the reunion festivities, Sadorf's crew preflighted the airplane. Accompanied by some "stray" showgirls, Doolittle and some of the Raiders showed up before the plane's departure for Wright Field.

Crewed by Lieutenant Colonel Richard Cole, Major Robert Bryant and Technical Sergeant Otto Barger with General Doolittle as passenger, they departed Las Vegas at 0815 hours, arriving at Scott AFB, Illinois at 1645 hours. After an overnight stay at Scott due to minor mechanical problems, they arrived at Wright Field at 1140 hours on the 21st.

Thus, Aircraft No. 3374 made her final landing and is now the centerpiece of the Doolittle Tokyo Raid exhibit at the USAF Museum.

About the Author: Norm, a marvelous engineer, historian and aviation author, is well known to readers because of the his many scholarly contributions to this publication and other historical aviation journals. He is the author of:

NORTH AMERICAN AVIATION AIRCRAFT
1934-1998 VOL. 1 *and*
B-25 MITCHELL, THE MAGNIFICENT MEDIUM

Both books are still available from Markiewicz/Thompson at (714) 542-7145. Jon Thompson gives a special rate to NAA retirees, so call for particulars. Norm now resides in Mt. Shasta, California.

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65 volts of power. The normal power level was 28 volts. The higher power was used to minimize the time required to pressurize the tanks to operating pressure and to achieve system stabilization.

LOX Tank #2 was manufactured at Beech Aircraft in Boulder, Colorado in 1966. After meeting all acceptance requirements, the tank was shipped to North American Rockwell in Downey, California in May 1967. At Downey, LOX Tank #2 became part of a shelf assembly along with LOX Tank #1 and associated plumbing, servicing disconnects, electrical and instrumentation equipment. When assembly of the shelf was completed, it was processed through the manufacturing test facility where mechanical, electrical and leak tests were performed. No LOX tests were performed because of facility safety limitations. These would be performed on the launch pad at the Kennedy Space Center (KSC).

After completion of the manufacturing acceptance tests, the shelf was delivered to the clean room where systems and full up vehicle tests were performed prior to shipment to KSC. In early 1968, the LOX shelf assembly had been installed in the Apollo 10 Service Module and testing continued in preparation for delivery of the vehicle. However, some Electromagnetic Interference (EMI) issues were identified which required removal of the LOX shelf from the Service Module.

Removal of the shelf required installation of a lifting tool which was attached to the front and the underside of the shelf. Disconnection of the shelf from the Service Module involved removal of a number of bolts from the pie shaped shelf. When the lifting tool was moved upward, the outer edge of the shelf followed but the inner tip remained in place. Unbeknownst, the removal crew had missed at least one bolt at the center tip of the shelf. When the structural load limit of the lifting tool was exceeded, the tool broke, resulting in the shelf dropping back into the Service Module.

Estimates of the height that the shelf dropped varied from one to six inches. In reality, no one knew. The shelf assembly was finally removed, electrical modifications accomplished and the shelf retested. It was installed in the Apollo 13 Service Module and in June 1969, shipped to KSC for mating with the Saturn launch vehicle.

Any damage caused to LOX Tank #2 when the shelf was dropped went undetected.

The Apollo CSM was mated to the Saturn launch vehicle and moved to Launch Pad 39. In March 1970, the countdown demonstration tests were begun to verify that Apollo 13 was ready for its moon landing mission. Testing included loading all power systems liquid oxygen and hydrogen tanks, powering up fuel cells and operating Apollo systems from internal power.

All test objectives were accomplished without incident until shutdown and safing operations were begun. Oxygen Tank #2 would not empty when normal procedures were used. These procedures consisted of injecting gaseous oxygen through the vent line and forcing the liquid oxygen out through the fill line. Only a small amount of fluid was expelled. Oxygen Tank #1 was emptied, using the same procedure, in a few minutes. Extensive consultations were carried out between Beech Aircraft, North American Rockwell and NASA KSC engineers to reach agreement on the best course of action.

It was agreed that the tank would be "pulse purged" by pressurizing with gas and then rapidly releasing the pressure, causing a sucking action to expel the fluid from the tank. This procedure worked but very slowly and became ineffective as the quantity dropped.

To speed up the process, the tank heaters were turned on using the higher power level, 65 volts, available from the ground power supply to "boil" the liquid out of the tank. This power supply was located in the mobile launch platform and could not be manned due to pad clear restrictions. Therefore, control of the power supply was from the Automatic Checkout Equipment (ACE) control room with limited visibility, i.e., the power supply current could not be observed in the control room. However, this procedure was considered safe because the tank heaters incorporated a thermostat that would interrupt power when the heater temperature reached 80°F.

Again, from the ACE control room, it could not be verified that the thermostat was indeed working. Had it been

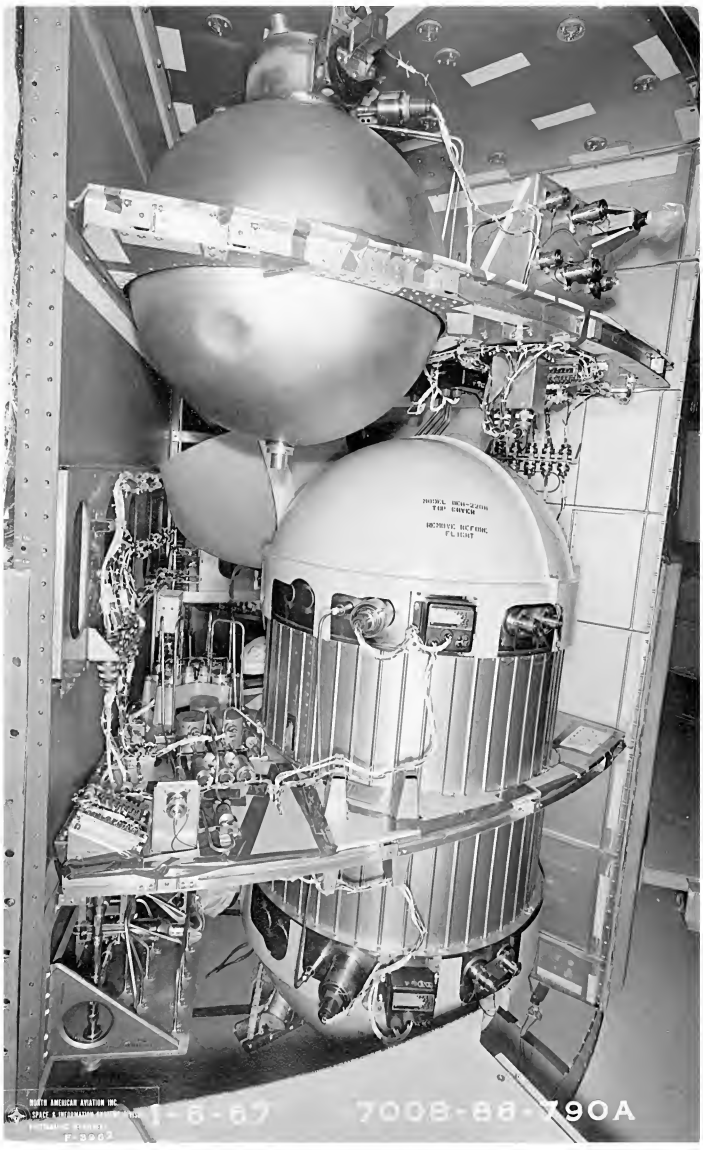


Photo from the Tom Barrera Collection
A view of the Apollo Service Module Sector IV showing the LOX and Hydrogen Vacuum Insulated Tanks installed on Modular Shelves.

monitored, it would have indicated that the tank heaters were on continuously for approximately eight hours. The tank was finally emptied.

It was decided that the emptying anomaly was displacement of the fill line during the shelf dropping incident in the Downey clean room. This resulted in a short, allowing the gas coming in through the vent line to escape without pushing liquid out of the tank through the fill line.

Accordingly, everyone concurred that, except for the difficulties encountered in emptying LOX Tank #2, the tank was functional and ready to support the moon landing mission. This decision was made not knowing that major damage had been done to the tank when the heaters were left on for a solid eight hours. The assumption that the thermostat would protect the heaters from overheating was wrong.

The thermostat had welded shut when it tried to interrupt the circuit carrying 65 volt power, the normal power level in flight being 28 volts. The subsequent Apollo 13 failure investigation revealed that with the tank half empty, the heater tube assembly was not fully immersed in liquid oxygen. Therefore, the cooling effect of the -279°F liquid oxygen was not there. Ground testing proved that the heater assembly reached temperatures as high as +1000°F, causing severe damage to the teflon insulated wiring within the tank. At this time, LOX Tank #2 was like an armed bomb and all it needed was a triggering event to set it off.



NASA Photo

Photo of damaged Sector IV of the Apollo 13 Service Module taken by the Crew just prior to returning to Earth.

Apollo 13 was launched on April 11, 1970. All went well until seven minutes, 53 seconds after 10 PM on April 13th when the crew turned on the LOX Tank #2 fans to destratify the fluid and shortly afterwards reported: *"Houston, we've got a problem"*. The stirring action caused by the fans had moved the badly damaged wires, initiating a spark when the bare wires shorted. The sparking wires ignited the teflon insulation fully immersed in liquid oxygen. The wiring was housed in a conduit which led from the bottom of the tank to the dome and exited the tank to interface with shelf wiring outside the tank.

The sparking wires caught fire and propagated within the conduit into the tank dome, rupturing the tank which then exploded, allowing high pressure oxygen to vent into the Service Module Sector IV. The rapid overpressure resulted in the sector door being blown away.

Photos taken by the crew shortly prior to reentry clearly show the sector door gone and extensive damage to interior hardware. In addition, the explosion or the subsequent door blowing away closed the fuel cell oxygen supply valves which starved two of the three fuel cells, resulting in loss of power. Also LOX Tank #l had extensive damage, resulting in loss of the breathing oxygen supply for the crew and the remaining cell.

Immediately following these events, Houston Mission Control and North American Rockwell engineers devised methods and procedures that allowed the Lunar Excursion Module to be used as a lifeboat, providing habitation and life support to the crew. On April 17, 1970, the Apollo 13 Command Module splashed into the Pacific Ocean and the crew was safely recovered.

About the Author: Tom came to Space Division at Downey in 1961 where he was assigned to the Apollo power systems design group. He was involved in all aspects of design, test and mission support. He participated in the investigation by the Cortwright Commission of the Apollo 13 failure and had an active role in the redesign of the LOX tanks subsequently used on Apollo 14. He received the Astronaut "Snoopy" award and the Sustained Excellence Performance Award from the Apollo 13 crew. Tom retired in 1994 as project director of the Extended Duration Orbiter program. He resides in Cypress, CA with his charming wife, Rose.

CONGRATULATIONS and BEST WISHES to

Kenneth Dyda of Rancho Palos Verdes, California on receiving the "Older Americans Recognition Day" award from Los Angeles County for his civic involvement and community service.

Joe and Joanne Cicchese of Lake Forest, California celebrating their 50th Wedding Anniversary.

Edmund and Krystyna Rusinek of Rossmoor, California celebrating their 50th Wedding Anniversary.

NAA Tech Reps In War And Peace

By John Casey

Shortly after America became involved in World War II, I became the Manager of Field Service Operations in charge of our Field Representatives, often called "Tech Reps". Although I was their boss, each of the Tech Reps stood alone in his responsibility for the aircraft he escorted and for the safety of the men using them. They came from various walks of life and each had a unique personality that attracted him to the risks and rewards of the job. I called them our "Warriors Without Weapons". All civilians, not military, they were veterans of a way of life that deserves recognition.

Decades before hand-held electronics became available, allowing managers "instant" communication anywhere in the world, we relied on our Tech Reps to write reports by hand and mail them into the home office. High-speed photocopying was also not an available luxury. Hence, all incoming reports were hand stamped with a distribution list, circulated to each concerned manager, one by one, who read and signed them off along the way.

Not long after I became Manager, I had the good fortune to have Jim Armitage leave the Experimental Flight Test Department and join me as my assistant. One of our most important tasks was to select new Tech Reps. Being a top-notch aviation engineer was only part of what constituted a good Tech Rep. Jim and I screened the candidates carefully through a series of interviews to help us determine how these men would think on their feet in the midst of a crisis anywhere in the world. Each would have to stand alone through a series of unique circumstances, repeatedly making the best assessments and solutions for rapidly changing situations.

Decision made by a Tech Rep represented an enormous investment in manufacturing dollars, protection of human lives and the support of corporate and national strategies. We were seeking that rare combination of excellent technical expertise, outstanding decision making skills, and tactful finesse with the customer, company leaders and coworkers.

Perhaps it was the allure of being on an expense account in a foreign country or a yearning to see the airplanes in action, but some of our aircraft mechanics would apply for the Tech Rep jobs again and again. One such young man, an absolutely brilliant mechanic on the flight line—I will call him "Jack"—showed up every time we posted openings for Tech Reps. He was refused each time.

Jack could be seen after work, walking along Manhattan Beach—wearing a helmet and goggles and carrying a parachute slung over his shoulder. I don't know who he was trying to impress or where his dreams were taking him but he got involved in another memorable incident when Frank Lyons was still in the group.

The NAA Flying Horsemen Club held their annual dance at the Inglewood Country Club which was open to any NAA employee. The ballroom was decorated with two huge wagon wheel light fixtures. Sometime during the evening, Frank told Jack to go across the dance floor to the other light and to await his signal to jump up and swing from the light fixture. Jack scurried across the floor and when Frank yelled "Go", he leaped up and grabbed the fixture. Of course, the fixture couldn't bear the weight of man and fixture and both came crashing down.

Fortunately, no medics were required. Frank was still laughing when the police escorted Jack out the door.

During the course of our hiring interviews, we would get to know these men very well and by the time they were offered the job, they knew that they were part of a select group who could be rightfully proud of representing the company. They also knew that their individual behavior was reflective of the whole company. The Tech Reps we hired were furnished with distinctive coveralls and jackets with the NAA logo and the words "Tech Rep" proudly embroidered on the back.

One of our newest Reps, Arnold Marcum, had a flight mechanic for a roommate. One evening after work, I happened into Jake's Bar in Manhattan Beach where many of the Reps hung out. I noticed someone sitting at the bar wearing an NAA Tech Rep jacket so I sat down next to him. Imagine my surprise when I did not recognize him! Without letting on as to who I was, I started a conversation with the young man who boasted that he worked for John Casey and that he was shipping out the next morning for an assignment in China. Handing him my business card, I suggested that he stop by my office before he shipped out. Naturally, he never showed up and, as far as I know, that was the last time anyone "borrowed" Arnold's jacket.

Hal Menjou, the son of the movie star Adolphe Menjou, was a P-51 Tech Rep assigned to the Far East. The P-51 had an air scoop which operated off an actuator manufactured by Robert Shaw Industries. In the early days, it was not very reliable. In one of his reports, Hal sent a photograph of himself with a hammer in his hand looking over a table strewn with a myriad parts of an actuator. The enclosed caption read: *"The inventor of this equipment should be taken aside and instructed in the fundamentals of engineering."* The head of the Electrical Group, John Maxian, was furious with Hal's report and stomped into my office, insisting that I recall Hal to the home office and discharge



Photo from the Norm Avery Collection

The B-25J equipped with factory designed and built eight gun nose added to the four fuselage blister packs. The eight gun nose could be bolted to any B-25 and many B-25Ds were so fitted by the 7th Air Force in Hawaii in preparation for the attack on Japan in 1945.

him for his irreverence. I just laughed it off—it was business as usual!

The Experimental Flight Test Department Maintenance Crew was part of the Field Service Department. This allowed us to transfer mechanics into our Tech Rep school as instructors or for other training. The Production Flight Line also had a pool of mechanics to draw from. The foreman of this group would get exasperated when we asked for certain individuals, usually his best men.

One outstanding individual was John Henderson. He became a Senior Tech Rep during the Korean War. Jack Fox, who went to Australia with the B-25s was also an inter-departmental recruit into the Tech Rep program. While in the Far East, Jack and Col. Pappy Gunn modified the B-25s, installing eight .50 caliber heavy machine guns in their noses to strafe Japanese shipping and landing barges.

As more B-25s were being sent to the South Pacific during World War II, more Tech Reps were required. Our branch office in Australia handled the paper work, expense accounts and technical reports for these men. Many of their reports contained sensitive and/or censored information. The reports would arrive at our home office in Los Angeles looking more like ticker tape or piano player scrolls with square holes cut out of them. This was also true of the Tech Rep reports received from Europe through our London office.

Al Lofquist, Bill Carr and Jack Carter were assigned to the B-25 aircraft sent to North Africa and could report back only through the engineering officer on problems specific to the aircraft, or as needed to train and advise the military personnel. Al was later sent to an off-site base, where 500 P-51s were arriving, to assist in the uncrating, assembly and checkout. Jack Carter was sent to the China-Burma-India (CBI) theater to provide technical assistance in the assembly of arriving B-25s there.

Sometimes, weeks would pass without hearing from either of them, since their exact location had to remain undisclosed. It was critical that no clues be intercepted by the enemy as to the kind of aircraft being delivered, their number or condition. Absolute silence was the best guarantee to maintain total secrecy.



Photo courtesy of the Boeing Historical Archives

The North American Aviation simplistic design permitted easy access and servicing of the eight nose guns aboard the B-25J.

America is celebrating a century of aviation history. The nation is proudly reviewing its legacy of conquering the skies in peaceful pursuits and the powerful defense of our very being. It is also the story of my life in leading the men that kept our planes aloft in many challenging situations. I look back with pride, remembering the great men I worked with and the excitement that working at NAA provided.

About the Author: John Casey grew up on a farm in Indiana during the Depression. There was no money for college, so he joined the U.S. Marine Corps Aviation branch. Completing his training, he flew hurricane patrol from St. Thomas in the Virgin Islands. After his discharge, he flew with Pan American Airways on their Atlantic flights. While with the Marines, he pursued a college degree through correspondence courses and, finally, achieved this goal while working at NAA by attending night school. He is retired and currently living in Corvallis, Oregon.

The Annual NAA Retirees Dinner at Grants Pass, Oregon was held on September 3, 2003



High School Junior Receives Coveted NASA "Snoopy"

By Donald B. Thompson

In 1967, I was the NAA Mission Staff Engineer for Apollo 7. Apollo was essentially a gigantic development program in that each mission, in sequence, provided the basis for the accomplishment of the succeeding mission.

As the MSE, my tasks were multiple and demanding including coordination of all mission reviews, assuring that the Mission Directive was properly reflected in the Flight Plan, verifying that subsystem test objectives, and their supporting measurements, were in compliance with the mission, representing NAA to the Customer and making certain that the needs for the succeeding mission were properly planned. At the conclusion of each mission, the Flight Report had to be coordinated to verify that all mission objectives were accomplished and properly documented.



Stephanie Black receives a special commendation with her Snoopy award from Melvin Grey, NASA Chief of the Resident Apollo Spacecraft Program Office (RASPO) with proud parents, Diane and Don Thompson, in attendance.

In preparation for one of the series of critical reviews for flight readiness, the NASA would submit questions directed at subsystem performance. For this particular review, the NASA had submitted 50 questions and I had gathered the responses and, as usual, was doing the editing at home over the weekend.

I was going over the questions and answers and preparing the material for formal presentation when I came to one that addressed the fuel cells, their potable water byproduct and the sensor that validated the acceptability of the water for astronaut consumption. NASA surgeons had asked if Litmus paper was a suitable backup for the sensor. In effect, the NAA reply was a cryptic "Yes." In my editorial role, I wanted to flesh out the answer but couldn't remember which color Litmus paper turned to indicate acid or base.

My oldest stepdaughter, Stephanie Black, was a junior in high school, taking chemistry, and seemed a logical and handy person to ask. I said, "Stephanie, which color does Litmus paper turn to indicate acid or base?" Her reply was why did I want to know? So I explained about the fuel cells, how they generated power for the mission, and as a byproduct produced potable water for astronaut consumption with the need to provide a backup in the event of sensor failure.

Stephanie then said, "Don't use Litmus paper, use Hydrion paper." She went on to explain how the Hydrion paper changed color such that the pH of the solution could be directly determined from very acidic to alkaline. Well, this was the sort of thing that this MSE liked to have as an answer to a technical question.

The following day, Monday, I sat down with my manager, Mike Vucelic, to go over the answers to the 50 questions. When we came to the fuel cell water question, I said that we, NAA, would rather use Hydrion paper instead of Litmus as recommended by the NASA surgeons. Mike wanted to know why, so I told him the whole story. He loved it!

Mike goes to Houston for the review of the 50 questions. When he gets to the fuel cells question, he gets somewhat dramatic and states firmly that NAA experts do not concur with the NASA surgeons to use Litmus paper but rather recommend the use of Hydrion paper. Well, the NASA surgeons, naturally, are taken aback and demand to know who are these so-called NAA "experts".

Mike replied, "A high school junior and her chemistry teacher." As you can imagine, the meeting broke out in laughter and surprise. Mike called me immediately after the meeting and told me to get samples of the Hydrion paper so NASA could test their application. I went to Pacifica High School in Garden Grove, explained the purpose of my visit to the chemistry teacher, received several samples and forwarded them to Houston for the NASA surgeons to test and verify.

After the Apollo 7 mission, the crew "came home" to Downey on November 7, 1968. Stephanie, along with 151 NAA employees, was presented the Astronauts "Snoopy" commendation. In the enumeration of the awardees, she was listed as a member of Apollo Engineering. In addition, she received letters of praise and gratitude from Robert Gilruth, Director of the Manned Space Center, and NASA Astronaut Edward Gibson.

To this date, no other non-contractor individual or someone not connected with the Space Program in any capacity has received this coveted award for their contribution to the Space Program. And, 35 years later, Stephanie's suggestion is still in the program. pHydrion paper, as it is now called, is included in the Shuttle medical kit, has supported more than one experiment, and has been in space on every Apollo and Space Shuttle mission since Apollo 7.

Contrails From The Past

by Ed Rusinek

Dear Ed,

The letter from Clarence Bauer in the Fall Issue about the rocket assisted F-86 brought home memories. Alden Dean and I were assigned to the project by our supervisor, Marshall Rowe. The program was initiated by the Taiwanese Government to counter the mainland Communist Chinese who were overflying Taiwan and photographing their latest defense installations. Their F-86s could not climb fast enough to intercept them so they came to NAA to find a solution.

We came up with the rocket motor installation which was attached to the center wing area on the bottom of the fuselage. We also added a fairing to reduce the drag of this protuberance. All this was done with the help and advise of the design groups involved.

With the installation completed, we proceeded with the flight testing to determine the flight characteristics and performance of this pregnant bird.

Everything worked as predicted, so we brought in a Taiwanese pilot to verify that the bird met their requirements. During his test flights, a level flight speed power test was done at high altitude in which the bird attained Mach 1.4 and it climbed like a cat with its tail on fire! The aircraft was accepted and shipped to Taiwan. We never heard further about this unique airplane.

— Arthur J. Moon, Torrance, CA



Photo courtesy of Clarence H. Bauer

Dear Ed,

I just wanted to comment on the article in the Fall Issue about the rocket powered F-86. This was a program that came into fruition in the Fall of 1959 as I was leaving NAA for ODDR&E. Since I had just completed the ZEL program, it was of special interest since my neighbor and good friend, Jim Brooks, was the project pilot. To confirm my memory, I called Jim and he stated that yes, he was the project pilot. To the best of his recollection, he made three flights, including one where he reached an altitude of 58,000 feet. This feature is included in an exhibit at the Smithsonian Air & Space Museum in Washington.

Keep up the good work on the Bulletin.

— Al Blackburn, McLean, VA

Ed's Resp.: Thank you Clarence, Arthur and Al for a great chapter in the F-86 Sabre story!

Dear Ed,

Sometime in the mid-'70s, while Rockwell's Corporate Policy Director, I visited the Smithsonian's National Air and Space Museum in Washington, D.C. Inside, immediately to the right of the front entrance was a P-51 with a "Rockwell International P-51" nameplate posted in front of it. Having been employed by North American Aviation in 1960 and having built several models of the P-51 as a teenager during WWII, I was quite upset that North American Aviation was not credited with this historical airplane.

I sought out the curator for that section of the museum and expressed to him my concern. A year or two later, I again visited the museum and found to my great delight that the nameplate had indeed been changed and that North American Aviation was now acknowledged as the developer and manufacturer of the P-51. I again found the curator and thanked him for making the change, quite satisfied with my efforts but a bit concerned that Al Rockwell might discover who caused the change. So I kept my little secret for these many years.

— Bud Klecker, Garden Grove, CA

Ed's Resp.: We certainly are not going to tell him!



Grants Pass Retirees Picnic Winners

The yearly Grants Pass, Oregon NAA/RI Retirees Picnic at Indian Mary Park would be incomplete without the annual Horseshoe Contest. The winners this year receiving their individual recognition from Bill Francis (with cap), the contest chairman, included for Third Place: Ida Francis and Evan Shriner; for Second Place: Lee Heiss and Dennis Cleek; and for First Place: Linda Morse and Bob Hansen. Next year the group will hold its 25th Annual Picnic on September 8, 2004.

North American Flying Horsemen 19th Annual Reunion





North American Flying Horsemen
November 04, 2003
Retiree Bulletin

The nineteenth annual Rowdy-O of the North American Flying Horsemen was held September 6, 7 and 8 at Linda and Bob Morse's home in Grants Pass, Oregon. Tim and Audrey Corkery aided the host, Bob and Linda Morse. The reunion was dedicated to the memory of our late Captain Charlie Wolfe who was loved and admired by all the members. The reunion dates were scheduled so one could also attend the Grants Pass picnic held September 3rd and 4th. The activities started Saturday evening where a light dinner was served and a special meeting was held by the board of directors to discuss future finances. If Bob Morse, the troop's treasurer, were allowed to oversee California's financial health, Gray Davis would still have a job. On Sunday morning, after church services, we all met at the Grants Pass Golf Club for an outstanding and enjoyable troop hosted breakfast. Food seems to taste better when it's free. The twenty-five cents we paid a week while we were an active troop, from 1937 to 1966, has sure paid off. Following breakfast the Vice Chairman; Stan Mellin and Directors; Ted Mociun, Bob Morse, Harry Shapiro and Jim Walsh held their yearly business meeting while others visited with each other and browsed through the scrapbooks consisting of photographs from 1937, the start of the club, to the present. People stayed close by for it was a typical summer Oregon day, overcast and light rain but very healthy. Every two years elections are held and this year the following positions were appointed; Chairman, Stan Mellin; Vice Chairman, Jim Walsh; Ted Mociun, Director/Historian; Bob Morse, Director/Treasurer and Harry Shapiro, Director/ Secretary. A general meeting held with the membership followed the director's meeting then the traditional shrimp feed was prepared. The shrimp and the associated sauces are prepared using a secret recipe developed many years ago with the intent to separate the dudes from the horsemen. You have to remember the North American Flying Horsemen was strictly a men's club and it was at a time when nobody questioned it. However, over the years most of the wives survived and the secret shrimp recipe has been tamed.

The next reunion, the 20th, will be held Friday, Saturday and Sunday, September 17, 18 and 19, 2004 at the Eskaton Lodge, Grass Valley, California and will be hosted by Ted and Marilyn Mociun. Our chief cook, Bill Monzon, will prepare a special Friday evening dinner of Paella at the next reunion.

19th Annual North American Flying Horsemen Attendees:

Diane and Marlin Albert, La Mirada, CA	Tim and Audrey Corkery, Winnetka, CA
Grace Farren, Mukilteo, WA & Palm Desert, CA	Pat Gangle, Grants Pass, OR
Bert and Shirley Krock, Lyons, OR	Stan Mellin, Rancho Palos Verdes, CA
Ted and Marilyn Mociun, Grass Valley, CA	Michael Mociun, Wahoo, HI
Bill Monzon, Westminster, CA	Bob and Linda Morse, Grants Pass, OR
Harry and Joan Shapiro, Yorba Linda, CA	Jim Walsh, Rancho Palos Verdes, CA

Enclosed find a photograph of the clubs members, wives and friends. From left to right are Bob and Linda Morse, Grace Farren, Marlin and Diane Albert, Ted Mociun, Stan Mellin (just behind Ted), Bill Monzon, Pat Gangle, Harry Shapiro, Bert and Shirley Krock, Marilyn Mociun, Jim Walsh, Joan Shapiro, Audrey and Tim Corkery. Mike Mociun took the picture.

Respectfully,
Harold Shapiro
Secretary, North American Flying Horsemen

B-1 Annual Reunion

United States Air Force B-1B LANCER

More than 133 past and present B-1 employees attended the second annual reunion held on September 20, 2003 at the Golden Sails in Long Beach, California. With guests from as far away as Florida, Northern California and Nevada, B-1B General Manager Scott White gave a very colorful and informative update on the current status and performance of the B-1B.



Hal Raiklen and Ralph Ruud



Art and Sharon Goudreault



Diane and Dave Connell



Carol Pederson and Dean Bolin



John Pierro and Sam Iacobellis



Lou Tiberou and Sonny Robertson



David Marshall, Dennis Hill, and Jeff Taylor



Carolyn Morris and Nancy Steele



Don Safarik, Sonny Robertson, David Marshall, Gerry Shoemaker, David Baker, and Cathy Boot



Scott White, Harold Raiklen and Howard Chambers



Walt Sanders, Gerry Northway, Lynn Isomoto, Rod and Paula Baille

The Silent Majority

by Stan Guzy

ANDERSON, FRANCIS E., 86 - died of natural causes on October 25, 2003. He was an electrical inspector at Rockwell International.

BACON, RICHARD N., - died in early October 2003 of undisclosed causes. He worked in Project Engineering at Autonetics on various programs including the Minuteman Guidance and Control System. Richard transferred to the Finance Department before retiring in 1984.

BLAUE, LAURA E., 88 - of Garden Grove, CA died November 6, 2003 of unspecified causes. She was a retired planner for NAA/RI. No further data available.

BOURS, FLORENCE E., 75 - died on July 13, 2003 at Rancho Springs Medical Center in Murrieta, CA of undisclosed causes. She worked in the industry for 31 years before retiring from RI Downey in 1985.

BROWN, HAROLD, 90 - passed away peacefully and quietly in the presence of his wife and family on August 26, 2003 of undisclosed causes. He had a long and distinguished career with NAA/RI including service in the Pricing and Estimating function. His memory is cherished by his wife of 65 years, Bettye.

BURGETT, VERN "BERGIE", 67 - passed away on October 3, 2003 with the comfort of his wife at his side after a courageous battle with brain cancer. He had worked at Rocketdyne for 44 years.

CHASTAIN, LYNDA L., "BIG RED", 65 - died of a heart attack at her home in Long Beach, CA on September 26, 2003. She retired in 1997 from Autonetics after 38 years of service. She is survived by her loving husband, Paul.

COLLIPRIEST, KEITH B., 78 - died on October 7, 2003 of heart disease. He had been an engineering supervisor for RI. No further data available.

CONNER, HARRY A., 72 - passed away in Glendale, AZ on April 7, 2003 of undisclosed causes. Harry worked at Space Division for 25 years before retiring in 1988. His loving wife, Rita, survives him.

CONNOLLY, STEPHEN M., 66 - expired at his home in Anaheim, CA on July 28, 2003 of Renal Cell Carcinoma after several months of declining health. He had been a project manager at Autonetics before retiring in 1991 after 32 years of service.

FERGUSON, DONALD W., 92 - died on September 9, 2003 at the Devonshire Care Center in Hemet, CA of undisclosed causes. He had been an aeronautical engineer with NAA/RI for 29 years before he retired in 1972.

FETTERLY, JOHN H., 80 - died August 25, 2003 of a heart attack and complications brought on by lung cancer. He had been an engineer at RI.

FISCHER, JOHN J., 79 - died on October 28, 2003 of causes yet to be determined. He was an aerospace engineer at Autonetics before retirement.

GARDNER, RALPH D., 77 - died of a heart attack on October 2, 2003 in Anaheim, CA. He retired from Space Division in 1990 as an engineering supervisor for Payload Integration. His loving wife, Ruth, survives him.

GRACE, ALFRED J., 81 - died August 12, 2003 of undisclosed causes with his friends at his bedside. Al had been a long time employee at RI. No other data available.

GREGG, PHILLIP W., 77 - passed away peacefully on October 15, 2003 at home in Huntington Beach, CA of undisclosed causes. He had been a planner for NAA/RI and MCDAC for over 30 years before retiring. He is survived by his wife of 24 years, Frances.

HAMMAN, HENRY F. "FRED", 79 - died on November 7, 2003, a day after his birthday, of complications of cancer. He had become corporate attorney for Rockwell Intellectual Properties (commonly called "patents"), and became an expert because few of the company's patented items or formulas were public knowledge. After an extremely successful career, he retired in 1973. His wife, Jean, survived him.

HOLLINGSWORTH, JOHN H., 84 - died on August 11, 2003 in Sun City, CA from complications of pneumonia following a period of declining health. In 1938, John began working as a sheet metal mechanic at NAA. After 47 years with the company, he retired in 1985 as a Director of Manufacturing. He worked on many notable projects including the P-51, F-86, X-15, B-70, Saturn Stage I booster, Apollo, B-1 and as a loaned executive on Lockheed's Stealth Bomber project. He had also been a past president of the NAA Bald Eagles Club. His second wife, Dolores, survives him.

HOLUB, SR., ALBERT R., 85 - died suddenly at his home in Anaheim, CA of undisclosed causes. He was a gyro instrumentation technician and retired at age 78 after 38 years of service with Autonetics. He is survived by his wife, June.

JAMES, DELMAR R., 71 - died on September 11, 2003 at Inland Valley Medical Center in Wildomar, CA. He worked as a nuclear physicist for 15 years for RI.

KIEFER, CARL, 78 - of Anaheim, CA died of cancer in January 2003. Carl retired in 1985 as Director of Facilities at the Anaheim complex after 25 years of service.

KEITH, MIRIAM O., 71 - passed away on August 31, 2003 in Missoula, MT from complications arising from diabetes and heart failure. Miriam retired from Autonetics in 1992 as a Senior Engineering Planning Administrator. She began her career at the Curtiss Company facility in Columbus, OH and stayed on when NAA took over the facility. She transferred to Autonetics in 1960. Miriam resided in Brea, CA until illness forced her to move closer to her family. Her former husband Blaine, survives her.

KEMP, ROBERT H., 84 - died August 15, 2003 of undisclosed causes at Escondido, CA. He had been in Engineering Management at NAA for 35 years and at one time was the Chief Project Engineer for the F-100 program.

KEMSEL, FRANK E., 75 - died of a heart attack on September 7, 2003 in Orange, CA. He had been a design engineer at Rockwell prior to retirement. He is survived by his wife Rita.

KING, MAX R., 74 - died in Hemet, CA on July 10, 2003 of myelofibrosis. He was a publications analyst with RI for 32 years before he retired in 1992. His wife Beverly survives him.

KORR, MARTIN, 84 - of Fullerton, CA died of a heart attack on September 8, 2003. He had been a machinist at RI before retiring.

LEAVITT, ELMER A., 82 - died on November 11, 2003 at Sunrise Assisted Living in Hemet, CA. Elmer worked as a plater at North American Rockwell for 34 years. A veteran of World War II, he was buried at the National Cemetery in Riverside, CA.

LENT, HARRY C. "PETE", 91 - presumably died of old age during the first part of this year in Westminster, CA. He had worked as a production line supervisor for NAA/RI at the LAD and the Palmdale Facility prior to his retirement in 1976.

LEON, ALEX, 79 - died September 1, 2003 of cancer. He had served as a fireman and EMT for RI. His wife, Mary, survives him.

LOGAN, KATHRYN M., 81 - died unexpectedly on August 31, 2003 at her home in Millville, CA. She had been undergoing treatment for congestive heart failure. As an honors mathematics graduate from Cal with a Phi Beta Kappa she was given high-level performance research assignments on the Mustang and Twin Mustang in the Aerodynamics group. She was the first to successfully predict the top speed of the Twin Mustang at 503 mph. She is survived by her husband of 60 years, Sam, a member of the Bald Eagles Association.

MACK, SAMUEL A., 76 - died September 14, 2003 of undisclosed causes at his home in Nuevo, CA. He had been in data management at RI for 37 years. He is survived by his loving wife of 48 years, Barbara.

MADSEN, RAYMOND W., 84 - died on July 25, 2003 in Aurora, NE from undisclosed causes. He went to work at NAA/RI in 1962 and remained with the company until he retired in 1989. He continued to work at NAA/RI as a consultant for several years before moving to Hampton, NE in 2002. He is survived by his wife, Georgialee.

MAGIN, RAYMOND A., 88 - died on July 31, 2003 at his home in Hemet, CA of undisclosed causes. He had been a mechanical engineer and assisted in the development of early jet engines at GE and Northrop before coming to RI. He retired from RI in 1973 after 28 years of service. He is survived by his wife of 57 years, Katherine.

MANNING, MARTIN J., 77 - died June 16, 2003 of pneumonia. An aerospace engineer at NAA, he lived in Costa Mesa, CA.

MASSIE, RALPH L., 76 - died on June 14, 2003 in Wofford Heights, CA after a long illness. He worked as a tooling supervisor at Rocketdyne before retiring in 1982. His wife, Bobbie, survives him.

MATHENA, CLOVIS E. "MATT", 86 - passed away on June 6, 2003 in Salem, OR of complications resulting from a heart attack. He had been a tooling supervisor at LAD in the Assembly Tools Department. Matt suffered a heart attack while watching his grandson play baseball. He is survived by his wife.

MAZUR, EDWARD A., 79 – died January 20, 2003 of pneumonia. He lived in Cypress, CA and was an interior wood fabricator for NAA/RI/Boeing. His wife, Dolores, survives him.

McCANN, RAY, 78 – died of cancer in Tustin, CA in February 2003. Ray retired in 1988 after 35 years of service as an industrial engineering supervisor at LAD and Autonetics.

MILLER, LAWRENCE J., 75 – an NAA/RI employee for 30 years. No other data provided by Joe Gilbert.

MOORE, CHARLES W., "CHUCK", 92 – passed away April 24, 2003 at his home in Hilo, HI. He had worked in manufacturing engineering at the Los Angeles and Tulsa Divisions. He also represented NAA at a subcontractor plant in Evansville, IN during his 30 years in the aerospace industry. His loving wife survives him.

MORLEY, RICHARD A. "DICK", 73 – passed away August 5, 2003 in Tucson,AZ. His death was brought on by pneumonia and kidney failure occurring after a successful aneurysm procedure. Dick worked for 20 years at the Columbus Division before transferring to LAD on the B-1A program. He retired in 1984 from the B-1 Test Equipment Design area as a supervisor. His wife, Betty, survives him.

MOSLEY, MYRTLE M. "MARIE", 84 – died on October 20, 2003 of unspecified causes at her home in Wildomar, CA. She was employed at NAA/RI in El Segundo, CA as an assembly line worker for 12 years.

MURPHY, GEORGE, 77 – of La Mirada, CA passed away on March 5, 2003 of heart failure. George retired in 1988 with 32 years of service as a facilities and industrial engineer at Space Division and Autonetics.

NEALY, ROBERT L., 69 – died of cancer on July 4, 2003. He had been Director of Operations and Quality Control. No additional data provided.

NELSON, FRANK K., 86 – died on August 21, 2003 at Chancellor Place Assisted Living in Murrieta, CA of unspecified causes. He had been an administrator for NAA/RI and worked on the Apollo project before retiring in 1982.

NOTKIN, SYDNEY, – of San Marcos, CA, passed away on August 25, 2003 of lung cancer. Sydney retired from LAD in 1973 after 21 years of service. He is survived by his loving wife Joyce.

NUNEZ JR., FRANK, 73 – passed away on October 2, 2003 from pneumonia brought on by complications of Parkinson's disease. Frank retired in 1989 after 28 years of service as a Financial Advisor at RI Corporate Offices.

PARISH, FREDDIE, 70 – died of unspecified causes on September 15, 2003 at Rancho Springs Medical Center in Murrieta, CA. He had been a manager and an engineer for RI and Hughes in El Segundo, CA before retiring in 1992.

PATRICK, JAMES W. "JIM", 80 – died of leukemia in Fullerton, CA on September 19, 2003. Jim worked in engineering on the Space Shuttle program and retired in 1987 after 36 years of service. He also had been the president of the Space Division Management Club in the eighties.

PERKINS, CLARENCE A. "PERK", 82 – passed away on September 27, 2003 at his daughter's home in San Clemente, CA. He died of heart failure after battling prostate cancer for over 13 years. He started in the Aerophysics Lab in Downey in the early fifties and took a forced retirement in 1986. He returned as a contract employee for another 10 years, working in Inertial Instruments Engineering.

PICO, ROBERT J., 85 – died on June 25, 2003 at the Hemet Valley Medical Center in Hemet, CA of unspecified causes. He had been a welding engineer at RI before he retired in 1980. His wife, Gwendolyn, survives him.

PRILL, FRED, 91 – passed away of undisclosed causes on September 30, 2003 in Yorba Linda, CA. In nearly 40 years at NAA/RI, his contributions played major roles in developing air superiority during WWII and the Korean Conflict. He worked on development of the P-51 Mustang and was the Project Engineer on the F-86 Sabre. He was Chief Engineer on the T-39 Saberliner development before retiring in 1977. Thelma, his wife of 66 years, survives him.

RODRIGUEZ, CARLOS C., 83 – passed away peacefully after suffering a stroke in San Antonio, TX with family members at his bedside. He had 37 years of service as an electrician for RI at Anaheim, CA before he retired.

ROMERO, JACOB I. "JAKE", 80 – of Torrance, CA died on September 20, 2003 of unspecified causes. Jake worked in LAD and Palmdale as a manufacturing engineer for 32 years. His loving wife, Alicia, survives him.

RUFFIN, WILLIAM O., 71 – died on September 23, 2003 of cancer. He retired as a supervisor at RI. His wife Sandra survives him.

SCHMIDT, KENNETH W., 83 – of Lake Forest, CA passed away on November 4, 2003 after a long illness. He served in LAD for 35 years before retiring in 1977 from the Design Producibility group. He is survived by his wife.

SMOCK, DARRELL J. "DJ", 91 – passed away on April 11, 2003 in Payson, AZ from dementia that had plagued him the last five years of his life. He had worked in the financial department at LAD. His wife survives him.

THOMAS, HARVEY A., 82 – died June 29, 2003 at Hemet Valley Medical Center in Hemet, CA of heart failure. He was an engineer at Space Division in Downey for 35 years before retiring in 1982. His wife of 60 years, Fay Ona, survives him.

THOMPSON, MARCUS F., 75 – passed away on March 4, 2003 of cancer in Owasso, OK. He retired from the Tulsa Division in 1984 after 25 years of service. His wife of 54 years, Lou Ann, survives him.

TREMAN, SALVATORE M., 90 – died July 22, 2003 at his home in Hemet, CA from undisclosed causes. During WWII he had been an assistant chief engineer for Bell Aircraft, then worked for Republic Aviation and Curtiss-Wright and finally NAA/RI where he was Chief Engineer on the Apollo project.

WALSH, ROBERT K. "BOB", 80 – died on October 18, 2003 in Alpharetta, GA from congestive heart failure. Bob retired from the purchasing department at LAD after 48 years of service. Information provided by Donna Walsh.

WHITEHEAD, ROBERT G., 71 – of Garden Grove, CA, died September 27, 2003 of complications from severe back surgery in 2000 and cancer. Bob served 30 years in Purchasing at LAD before retiring in 1987. His loving wife Lois survived him.

WILEY, WILLIS L., 80 – died October 14, 2003 at San Gorgonio Memorial Hospital in Banning, CA. He had been a machinist at NAA/RI for 15 years.

WILLIAMS, BAILEY A., 85 – died of congestive heart failure on July 18, 2003 at Kindred Hospital in Westminster, CA. He was a decorated WWII fighter pilot who flew P-38s and P-51s over Nazi Germany; was shot down, captured and escaped. He continued his service in the Air Force during the Korean War and specialized in reconnaissance and electronic counter measures. Following retirement from the Air Force in 1965, he became a Vice President of NAA/RI's electronic countermeasures division. He was instrumental in the creation and development of his proudest accomplishment, the Wild Weasel. His final project was the Space Shuttle *Columbia*.

WILSON, JOHN E., 83 – of Visalia, CA died November 13, 2003 of undisclosed causes. He had retired as Vice President of Marketing for Rockwell International. His wife Virginia survives him.

Editor's Note: The Silent Majority section is intended to inform of the final passing of NAA, NAA/RI and/or NAA/RI/Boeing retirees only. Please include all data relevant to the professional life and demise of the individual in order to make the obituary meaningful. Thank you!

PAX DOMINI SIT SEMPER VOBISCUM

RETIREES BULLETIN OFFICE
2600 Westminster Blvd.
P.O. Box 3644, M/C SJ51
Seal Beach, CA 90740-7644

North American Aviation Retirees Bulletin

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IF THE DATE ABOVE YOUR NAME IS DECEMBER 2003 AND YOU HAVEN'T YET RENEWED –
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Photo from the Norm Avery Collection

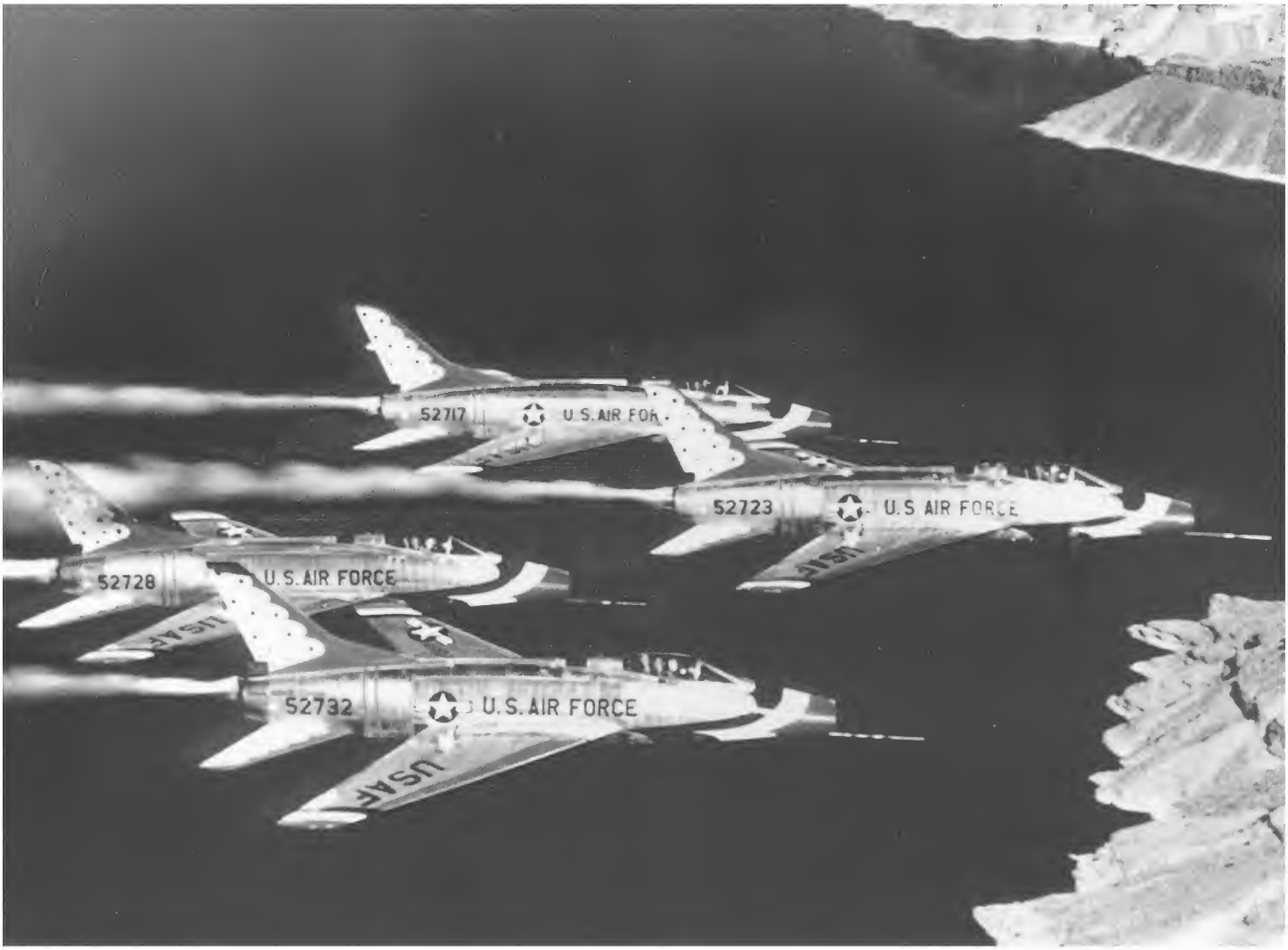
Doolittle Raiders during 1958 visit to the NAA/LAD facility in front of reworked and renumbered Aircraft No. 40-2344 including Field Service Manager John Casey, Ted Lawson, Engineering Manager Duncan Harding, Howard Sessler, Travis Hoover, Unknown, John Hilger, Unknown, and Griffith Williams.

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION
Retirees Bulletin

Spring 2004

Inside: **THE FIFTIES, A DECADE OF THE SUPERSONICS** by Al Blackburn
AN AIR FORCE PILOT REMEMBERS THE F-100 "HUN" by Gerald Larsen, USAF (Ret)
A MEMORABLE MISSION OVER KOREA by William "Bill" Yoakley
NORTH AMERICAN TEST PILOTS—W. R. "BILL" YOAKLEY by Chandler "Chan" King
WHERE HAVE ALL OUR HEROES GONE? by Ed Rusinek



USAF Photo from the Erik Simonsen Collection

THE 4520TH AIR DEMONSTRATION SQUADRON *"THUNDERBIRDS"*
STREAKING ACROSS THE NEVADA SKIES OVER NELLIS AIR FORCE BASE
IN THEIR NORTH AMERICAN AVIATION F-100C-10s

NORTH AMERICAN AVIATION
Retirees Bulletin

NAAR BULLETIN, an affiliate of the **Bald Eagles, Inc.**, is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

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Yes, I am a retiree of NAA/Rockwell and I want to subscribe to the NAA Retirees Bulletin. I am enclosing a check payable to the **Bald Eagles, Inc.** for $_____. For every $10.00 I will receive four issues per year. For $100.00, I can become a Silver Eagle with subscription for life.

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DEAR NAA RETIREE BULLETIN SUBSCRIBER

With this issue, we begin the year 2004. As I look over the issues we published these past few years, I am amazed at the quantity and quality of information that we have generated. All of the authors, retirees and/or historians, have provided a full spectrum of information about the company, projects, people and the very essence of North American Aviation. Whether you were the vice president of engineering or the janitor out in the shop, we are so very proud of all of you!

This issue has been taken over by the flyers in our NAA family. Most of the articles have been written by pilots or about them. Perhaps, the oldest of our writers, Chandler "Chan" King, is one of the six remaining members of the original Bald Eagles that migrated with Dutch Kindelberger from Dundalk, Maryland when he moved NAA to California. He, himself, is a legend and he has volunteered to write a series of articles about our NAA test pilots. His first effort coincides with an article written by the pilot he selected for his initial effort, Bill Yoakley. We have added Chan to the masthead and we are very proud to have him with us!

Test pilot and author, Al Blackburn, takes us back to the 1950s when breaking the elusive sound barrier was the dream of every aviation company and every test pilot. He is the best to tell the story because he, himself, was so deeply involved in this aerodynamic breakthrough.

We have another exciting surprise! Major General Gerald Larson, USAF (Ret), ran across a copy of our bulletin and asked if he could subscribe because of his love for NAA airplanes. We not only replied in the affirmative but we invited him to relate to us some of his experiences. His first article is in this issue. Thank you General!

Again, this past year we lost some of you to the Silent Majority and some who don't think we are worth the ten dollars. However, more than 450 of you have sent in the fee as Silver Eagles and that indicates to us that many of you are pleased with our humble efforts.

Although I stated that I would never publish my personal feelings in the bulletin because you, our subscribers, primarily want to read about what directly involves NAA/Rockwell, I think it is time to speak out and say what must be said. To make it clear that this is my opinion, I print it as a "commentary".

With the new year, many of you "Snowbirds" will be moving to temporary homes in other locations. Sonnie Robertson reminds you to please keep us informed of where you will be so that our bulletins are not returned stamped **"Address Unknown"**.

Until our next issue, stay healthy and try to stand in the shadow of God's Blessing!

Light travels faster than sound.
That is why some people appear bright until you hear them speak.

THE 42ND BALD EAGLES REUNION WILL BE HELD
ON SATURDAY, APRIL 17, 2004
AT THE PROUD BIRD RESTAURANT
11022 AVIATION BLVD. (AT 111TH STREET)

Doors open for Social at 10:00 AM. Seating for Lunch at 12:00 Noon
Send your check for $20.00 payable to the Bald Eagles, Inc. to:

VAL YARBROUGH
520 DEL ORO DRIVE
OJAI, CA 93023-1805
(805) 646-2283

Include with your check the name you wish on your badge and the name of each guest included in your payment. Tickets and badges will be issued as you register at the door. Seating is limited so order your tickets ahead of time! Sorry, no refunds after March 29, 2004.

There is no service requirement to attend—just the love for airplanes.
Meet old friends—Make new ones!
Parking is limited—Car pooling and early arrival is encouraged!

NAA/ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Bill Kelley at (714) 637-9374.

The Antelope Valley Retirees Club meets in the South Meeting Room of the Palmdale Culture Center at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell/Boeing retirees are welcome. For information, contact Bill "Tiny" Kisler at (661) 273-0213.

Boeing Valley Retirees Club meets on the 3rd Thursday of each month at the Canoga Park Rec Center, 8500 Fallbrook Avenue, Canoga Park, CA. The president is Jennie Muncaster at (818) 341-8919.

"The Old LAD Stress Group" meets for breakfast approximately every two months at Mimi's Café in Torrance, CA. If you are from the old LAD Stress Group contact Gene Laxton at (310) 378-3113 or Ed Rosenthal at (310) 375-8933.

"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meet at 11:30 AM on the 2nd Wednesday of the month for lunch at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd. and Mariposa Ave.

The NAA 101 Tooling Retirees Group meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at the Cimarron Café, 5160 190th St., West of Anza Avenue in Torrance, CA.

GPS Breakfast Club meets from 6:00 AM to 8:00 AM every Wednesday at the Primrose Restaurant, corner Seal Beach Blvd. and Westminster Blvd. All are invited. For more information, call Fred Shitara at (714) 750-1016.

Seal Beach Retirees Group meets at 11:30 AM on the 3rd Wednesday of the month at "The Fish Co." on Los Alamitos Blvd. at Katella Avenue. For more information call Marvin Blaski at (714) 848-5717 or e-mail to *mblaski@aol.com*.

The Facilities, Industrial Engineering and Plant Services Retirees Group meets at 11:45 AM on the 2nd Thursday of each month at Buster's (formerly Jolly Roger's) Restaurant in the Long Beach Marina. Contact Joe W. Mausser at (562) 596-5845.

Downey Engineering Group of Retirees known as the "Choir Boys" meets every Thursday for lunch at various restaurants from Downey to Seal Beach. Call Al Risi at (714) 892-5725 for meeting location.

"Ye Olde Pharts Breakfast Club" meets at 10:00 AM on the 4th Thursday each month for breakfast at Polly's Pies at 2025 N. Tustin Avenue in Orange. For information call Don Metzger at (949) 495-5374.

The North American Rockwell Retiree Club of McAlester, OK (a satellite of Tulsa, OK) meets at 10:30 AM on the 3rd Tuesday in March, June, September and December at the Down Town Meeting Place. Call J. A. Darden at (918) 423-0706 for more information.

Tulsa & McAlester Retirees meet for breakfast at 8:00 AM on the 2nd Monday in March, June, September and December at the Ramada Inn, 8181 East Skelly Drive in Tulsa, OK. Call Harry Phillips at (918) 838-3716.

The North American Rockwell Retirees Group of Columbus, OH Engineers and professionals meet at 11:30 AM on the 3rd Thursday of each month at the Berwick Park House. Contact Byron C. Solomides at (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH meets at Noon on the 1st Monday of the month at the Whitehall Community Park on North Hamilton Road in Whitehall. Contact E. Hamilton at (740) 927-5940 for information.

Autonetics Group including Marine Systems, Program Office, Project Office, System Test, Engineers and Designers meets for lunch on the last Wednesday of each month at the HomeTown Buffet, Rose Avenue and Alta Vista Drive in Placentia, CA. Call Mike Vohs at (714) 762-1925 for more details.

Autonetics Industrial Engineering and Maintenance Retirees meet for lunch on the 1st Thursday of each month at the HomeTown Buffet, 390 McKinley, located in front of the Home Depot, in Corona, CA. For more details, call Don Burt at (909) 698-0072.

Autonetics Flight Control Retirees meet at 11:30 AM on the 3rd Thursday of each month except in December at The Lamppost Pizza House located at 17568 Yorba Linda Blvd., corner of Richfield Road, in Yorba Linda, CA. Call Jim Anderson at (714) 779-5620 for details.

Autonetics Retirees meet for lunch at 11:45 AM on the 2nd Wednesday of every month at the Rembrandt Restaurant or the Yorba Linda Country Club. All Autonetics retirees, spouses and friends are invited. Contact Robert Nease at (714) 516-1844 or e-mail to *rfnease@email.msn.com* or Ed Venanzi at (714) 779-5652 or e-mail to *EdVennz@aol.com*.

A Group of NAA Retirees meets for breakfast at 8:15 AM on the 1st Wednesday of each month at Knott's Berry Farm-Chicken Restaurant. All are cordially invited. Contact Maxine Haun at *maxi3131@aol.com*.

Autonetics Financial Luncheon Group meets for lunch at Noon on the last Wednesday of the month at Marie Callendars, 126 East Yorba Linda Boulevard in Placentia. Contact Ken Cantwell at (714) 970-7171 or *Kcantwell@adelphia.net*.

A Group of Engineering Mgt. meets at 11:30 AM on the 3rd Tuesday of the month for lunch at Denny's on Imperial Hwy. and the 57 Fwy. Call Ed Moran at (562) 697-9949 for information.

NAA Tech Reps Assn. (TRA) Breakfast Club meets at 9:00 AM on the 1st Tuesday of each month at the Carlsbad Airport Restaurant. For more information, call El Presidente Rafael Colunga at (760) 940-0525.

Material Group retirees from Downey and Seal Beach meet at 11:30 AM on the 4th Wednesday every month at the Stox Restaurant at Imperial Hwy. and Bellflower Blvd. in Downey. Contact Marian Nielson at (562) 429-1020 or Joan Dominguez at (562) 865-7200 or e-mail to *tatedom@aol.com* for information.

Rockwell Vandenberg AFB Retirees Breakfast Club meets at 8:45 AM on the 2nd Tuesday of each month at the IHOP restaurant in Santa Maria. Contact Marv Bailey at (805) 929-6652 or Al Finley at (805) 937-3690.

ANNUAL EVENT

Bald Eagle 42nd Annual Reunion – will be held on Saturday, April 17, 2004 at the Proud Bird Restaurant. Call Val Yarbrough at (805) 646-2283.

The Hangar Gang – meets at the Proud Bird approximately every 4 months. For time, date and other details, call Gene Salvay at (818) 788-3974 or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

Flight Test Instrumentation Annual Reunion – meets annually at the Fullerton Elks Club. For information, call Frank Vigil at (562) 691-0236.

Tech Rep Association Picnic – A group of retired Field Service Technical Representatives has a yearly picnic in June at a park in Fallbrook, CA. For more information, call TRA President Rafael Colunga at (760) 940-0525 or e-mail to *rafael@nctimes.net*.

The Annual M&P, P.D.L., "Friends Christmas Luncheon" – This group of retirees and employees have assembled in mid-December for a festive luncheon and gabfest for the past 20 years. Those wishing to participate and receive notice of the next December luncheon, call Fred Koeller at (310) 545-8854.

NAA-K B-25 Reunion – will be held on Sunday, August 15, 2004 from 1:00 PM to 5:00 PM at the Wyandotte County Museum in Bonner Springs, KS. For more information, call Harry J. Desko at (913) 287-7223 or write to him at 3024 N. 47th St., Kansas City, KS 66104.

Grants Pass 25th Anniversary Picnic – will be held on Wednesday, September 8, 2004. Contact Bob Morse for details at (541) 474-1438 or e-mail to *lindabob2@earthlink.net*.

NAA Flying Horsemen will hold their reunion on Friday through Sunday, September 17 through 19, 2004 at the Eskaton Lodge in Grass Valley, CA. Contact Harry Shapiro at (714) 993-3496, fax (714) 993-1208 or e-mail *shapsplace@aol.com*.

To have your group or function listed in the CALENDAR OF EVENTS, please send the information to the NAA Retirees Bulletin including identification of the group, date(s) of the event, location including address and name of contact with phone number and e-mail. Send to NAA Retirees Bulletin, 2600 Westminster Blvd., P.O. Box 3644, M/C SJS1, Seal Beach, CA 90740.

The Fifties, A Decade Of The Supersonics

by Al Blackburn

In June 1954, I went to work for North American Aviation in Los Angeles as an engineering test pilot. I had just been released from active duty by the Marine Corps after two years at the Naval Air Test Center, Patuxent River, Maryland. Al White came out of the Air Force at the same time. We were there to help cover the loss of Joe Lynch, one of NAA's top experimental test pilots, a few months earlier in a tragic accident at Nellis AFB.

After getting a full suit of flight gear including g-suit, flight boots, and a helmet uniquely molded to fit my head, I was ready to go to work. In the mid-fifties, engineering flight tests were conducted out of Palmdale while production flight tests were flown out of LAX.

The T-28A trainer had been developed by NAA at LAX for the Air Force. Work on a Navy version of the T-28 was underway at the NAA facility in Columbus, Ohio. Some of the completion details for this aircraft were being done on the Air Force line at LAX. Two of these T-28Bs were sitting on the line at LAX when I checked in. I would get involved with these airplanes as one of my first projects at NAA, but first there were some F-86 Sabres to be ferried to the desert.

Remember, this was the middle of 1954. Just a year earlier, George Welch had made the first flight of an F-100A, *Super Sabre*, and had taken it supersonic in level flight! Not to be outdone, Tony LeVier did the same during the first flight of the Lockheed XF-104 *Starfighter*, equipped with an afterburner, on February 28, 1954. Before the end of the decade, eight more brand new US fighters would boom through the sonic barrier in level flight on their first excursion from their test sites in the desert. Two of these came from the creative genius of North American Aviation—the F-100 and the F-107. I know of none that have done so since. Truly, the Fifties was the Decade of the Supersonics.

My first task as an NAA test pilot was to ferry an F-86E from LAX to Palmdale. Chuck Graham worked at NAA in Customer Relations. In that capacity, he flew production test flights to stay current with all the new versions of NAA products as they came off the line. When it became obvious that the F-86 was fully capable of going supersonic, Chuck created the Mach Buster Club. A lapel pin depicting a Sabre penetrating the Sound Barrier was the badge of membership. It occurred to me that it would be a good idea to qualify for membership, but I had never gone supersonic. Taking the F-86E to Palmdale could provide the opportunity!

Climbing out of LAX, I was at 40,000 feet as I passed over Edwards. Continuing north to Harpers Dry Lake, I rolled into a ninety degree dive maintaining full power. Before I reached 30,000 feet, the Machmeter was hung up at Mach 0.96 then popped past Mach 1.0. I was a Mach Buster! Leveling out and retarding the throttle, I headed west and checked in with the Palmdale tower, hoping I hadn't busted any windows.

Several days later, I learned more about the T-28B project. The Navy version of this trainer was about thirty percent heavier, had thirty percent more power and had to be demonstrated to take the stress of carrier operations. It amounted to a structural demonstration by building up to maximum impact loads in successive steeper approaches and landings.

As best I remember, the maximum g-load was generated at sixteen feet per second vertical impact speed. In but a few short weeks, our team was able to attain and consistently repeat that goal. Of course, once we had achieved the maximum loads sought, the effort was taken over by the Navy. All subsequent structural demonstrations for Navy carrier operations were conducted at the NAA facility at Columbus or at Patuxent River.

Once the T-28B carrier suitability program was complete, I returned to the fighter programs that were the lifeblood of North American Aviation. There were the F-86K, basically an F-86D with 20mm guns instead of rockets for our NATO allies and other foreign customers, and the F-86L, a much modernized F-86D for our own Air Force.

Then there were the in-house development projects such as the LALSCD – Low Altitude, Low Speed Control Development-testing an F-100 with an in-flight thrust reverser and no afterburner. The other was the ZEL – Zero Launch consisting of an F-100 with a solid-state rocket booster strapped to the aft ventral side of the aircraft below the horizontal stabilizer and launched off a launcher, angled 30 degrees skyward. I did sixteen of the latter and bailed out only once when the booster hung up.

Then North American won the B-70 program and in seeking a backup pilot for Al White, I was encouraged to put a lot of flying time in the B-52. However, I decided that I prefer fighters. A subsequent introduction to the B-58 didn't really change my mind.

After five and a half years at North American Aviation, I was induced by Herb York to join him at the newly established Office of Defense Research and Engineering at the Pentagon. In reflection, I can firmly state that my experience at NAA was the most professionally and intellectually challenging of my life. While flying on the very cusp of advanced technology, I was also privileged to assist in the establishment of the So-



Photo courtesy of the AFFTC History Office

The Zero Length Launch (ZEL) was accomplished by attaching a Rocketdyne solid-fuel rocket motor to the bottom of the rear fuselage of the F-100D. The motor was capable of delivering 130,000 pounds of thrust, sufficient to accelerate the airplane from zero to 300 mph in four seconds. On his second flight, the rocket booster failed to come off and Al Blackburn had to eject. The remainder of the twenty test launches were successful.

ciety of Experimental Test Pilots and remain its senior surviving President.

At the NAA flight line, I made over 1,200 engineering test flights. Never did I find a more creatively assembled team of technical leadership—from Lee Atwood in the front office to crew chief Bob Cadick on the flight line, from John Casey, heading field service to maintain close touch with the Customer, to Harrison "Stormy" Storms for translating customer needs into technologically advanced new weapon systems.

The list goes on—flight test engineers Murray O'Toole, Frank Munds, Q. C. Harvey, Neil Scott—fellow engineering test pilots George Welch, Al White, Jim Brooks, Van Shepard, Bob Baker, Dan Darnell, J. O. Roberts, Bud Poage, J. Ray Donahue, Ray Morris, Bob Fero, Zeke Hopkins and Jim Pearce who led the Columbus pilots.

And the production test pilots, led by Jack O'Brian, including George Mattison, Paul Lawless, Spider O'Connor, George Smith, Bill Yoakley and at least a dozen more.

It was an era of enormous advancement in all phases of aviation leading to the next step—Space. It was truly the Decade of the Supersonics.

About the author: Upon graduation from the Naval Academy in 1944, Al entered the Marine Corps and saw infantry duty on Okinawa and in North China. He applied for flight training and obtained his wings in 1947. He flew carrier based Corsairs. Joining the Reserves and enrolling in graduate school at MIT, he received an MS degree in Aeronautical Engineering. Recalled to active duty, Al was sent to the Patuxent River Naval Air Test Center where he flew tests for the Armament Test Division. Released from active service, Al joined NAA as an engineering test pilot. He, subsequently, saw service at the Pentagon, in both the Strategic and Tactical Weapons Divisions of ODDR&E and became a Fellow of the Society of Experimental Test Pilots. He currently resides with Donna, his lovely wife of forty-seven years, in McLean, VA.

Supersonic First Flights In The 1950s

AIRCRAFT	DESIGNATION	COMPANY	TEST PILOT	FIRST FLIGHT DATE
YF-100	*SUPER SABRE*	NAA	GEORGE WELCH	5/25/53
XF-104	*STARFIGHTER*	LOCKHEED	TONY LeVIER	2/28/54
F-101A	*VOODOO*	McDONNELL	BOB LITTLE	9/29/54
XF8U-1	*CRUSADER*	VOUGHT	JOHN KONRAD	5/25/55
YF-105A	*THUNDERCHIEF*	REPUBLIC	RUSTY ROTH	11/22/55
F11F-1F	*SUPER TIGER*	GRUMMAN	CORKY MEYER	5/25/56
YF-107		NAA	BOB BAKER	9/10/56
F-106A	*DELTA DART*	CONVAIR	DICK JOHNSON	12/26/56*
XF4H	*PHANTOM II*	McDONNELL	BOB LITTLE	5/27/58**
N-156F	*FREEDOM FIGHTER*	NORTHROP	LEW NELSON	7/30/59

*Gear doors did not close on first flight. Supersonic on second flight on 12/27/56

** Gear doors did not close on first flight. Supersonic on second flight on 5/28/58

An Air Force Pilot Remembers The F-100 "Hun"

by Major General Gerald D. Larson, USAF (Ret)

Several months ago, General Larson ran across an NAA Retiree Bulletin and decided to contact us because of the close relationship he had with NAA airplanes. We invited him to write about his experiences and he favored us with the following article, which we hope will be followed by many more.

In 1956, most of us lieutenants at Bunker Hill AFB in Indiana had a few hundred hours of F-86E/F time and felt a genuine affection for that airplane. The Sabre had a proven air-to-air record, did the air-to-ground work well and was an absolute dream to fly. However, the F-86 supply support had hit bottom and most of our "long in the tooth" aircraft, lacking parts, were out of commission much of the time. Flying was at a premium for us. Too many lieutenants and too few tail numbers to fill the flight schedule.

We thought the F-100 would change all that and we were eager to move up to the newest—and reputed the best—set of wings in the tactical inventory. The F-100D transition of our squadron started in 1957. From Day One, we all were mightily impressed with the "Hun". Chocked on the ramp, it just plain looked mean and capable with its slick supersonic lines. *The huge air intake to feed the monstrous J57 engine and a strangely prominent exhaust nozzle. A beautiful airplane but—God—really BIG.* It was clear that this new chunk of iron on the ramp would demand respect from anyone sitting at the controls.

The older experienced F-100 pilots constantly sought to impress us neophytes with the need to exercise great care with this brute. After endless hours of classroom work covering aircraft systems, flight characteristics, operating limits, performance, etc. followed by numerous supervised walk around inspections, observing engine starts from the ladder, watching dozens of takeoffs and landings from mobile control, and, finally, getting long briefings by the flight commander—I strapped in for my first transition flight.

It was a magnificent day, with a clear Indiana sky. I was more than anxious to get airborne. Clearly, there was a lot to understand about this bird and as emphasized by more experienced heads it was definitely not a casual machine to mess with. However, from takeoff to touchdown rollout, this flight proved to be sheer joy. On takeoff, the engine power was startling—I managed not to overspeed the gear. As air work progressed, the J57 made a few strange bangs and chuffs as the compressor complained. Engine stalls were a new phenomenon—*OK, use better throttle technique.* Afterburner power was awesome—*Pay attention to airspeed and attitude when punching in or that pulse of flame out the front will tend to tense you up.* Why did compressor stalls blow your feet off the rudder pedals?—*Must remember to ask our tech rep about that.* Aircraft control—*Exceptional, but know the limitations because coupling was interesting at slow speeds and at the high speed end, a delicate touch was necessary.* Responsive—*I guess!*

Most memorable and certainly most important to a successful first flight, was getting this new beauty back on the ground—unscratched. The landing technique demanded by the F-100 was a brand new deal. Forget about the nice, tight comfortable traffic pattern of Sabre days.



Photo courtesy of the AFFTC History Office

In the Fifties, the F-100D-20 "Hun", as represented by AF S/N 55-3507, was the most versatile weapons system in the world. The "D" was the most widely produced variant with 1,274 built.

This all had to change to a larger, looser traffic pattern, with a smooth, flat powered approach and a greased touchdown. *Don't scrape the skid and thank God for that drag chute.* We only had a 10,000 foot runway but the anti-skid brakes provided more comfort—*Right! Damn, that touchdown was FAST; the 150 knots seemed like Mach 2.* Certainly, this airplane was going to take some getting used to.

In the midst of my squadron's transition program, there was a major reorganization. Headquarters dissolved the Bunker Hill tactical units and the resources were transferred to other TAC bases. I went to England AFB in Louisiana along with many of the other pilots and support personnel. The 401st Tactical Fighter Wing there was replacing their aging F-84Fs with the F-100Ds. It seemed to be a painfully slow process for the 401 TFW and there were plenty of growing pains. The spares program was not adequately planned, funded or both. We had problems with the F-100 constant speed drive, the anti-skid brakes would get wet and fail, pigtails cracked, drag chutes malfunctioned, the nose wheel steering didn't operate correctly and the afterburners were temperamental. But, there never was a lack of enthusiasm for the F-100. The vexing issues associated with the new and complex fighter were eventually resolved.

Flying time did not appreciably increase in the early stages of the F-100 program as we had hoped. Ten hours per month flying time was normal and for the pilots that was not enough. With the abundance of spare time, we all studied a lot and hoped that our scheduled tail numbers would come in-commission. At one point, the commander directed all pilots to polish engine exhaust nozzles—we obviously had to stay productive and learn everything about the F-100. This included packing and installation of drag chutes and learning how to service engine oil and accumulators. In time, the wing became combat ready and my squadron was the first to be deployed to Europe, picking up the NATO nuke commitment in Italy.

North American's great F-100, undeniably, put tactical air on the map—in fact, it put it all over the map! The airplane was a formidable weapons system that could do all the TAC air jobs well—conventional or nuke—as well as air superiority. Rapid squadron deployments were possible—almost becoming routine in 1958—just provide the KB-50 tankers. With it's broad capability, the NAA F-100 served the nation well! It was a challenging airplane to fly, demanding serious attention and full respect from the pilot. But, the Hun was predictable and, therefore, not a difficult beast.

There is a large community of ex-F-100 drivers out there that have nothing but good words and the fondest memories associated with this super airplane. I am one of them.

About the Author: A distinguished career officer, General Larson enlisted in the USAF in 1953 and was commissioned in February 1955 through the aviation cadet program. His first operational assignment was as a squadron pilot flying F-86s at Osan Air Base in South Korea. In October 1960, he was selected as a demonstration pilot with the 4520th Air Demonstration Squadron, the Thunderbirds, at Nellis AFB in Nevada. He flew the solo position and later initiated the double solo routine in the F-100C. The general attended the Aerospace Research Pilot School from August 1964 to September 1965 and was then assigned as an operational test and evaluation project officer with the Tactical Fighter Weapons Center at Nellis AFB. Further assignments included service in Washington D.C., Thailand, England and Germany. The general is a command pilot with more than 6,700 flying hours and 235 combat missions. His decorations and honors include the Silver Star, Legion of Merit, Distinguished Flying Cross, Meritorious Service Medal, Air Medal, and Air Force Commendation Medal. He and his charming wife retired to Rancho Bernardo, San Diego, CA.



NASA Dryden Flight Research Center photo

X-Planes—the North American Aviation XB-70 and X-15A-2 on the ramp at the Dryden Flight Research Center at Edwards AFB in 1967.

A Memorable Mission Over Korea

by William R "Bill" Yoakley
In Memory of Lt. Willie Wall, KIA

We invited Bill Yoakley to provide us some reports about his flying experiences. Although his first effort did not include an NAA airplane, it was too good to pass up. We think you will all agree.

On March 19, 1951, my flight of four aircraft was briefed for an armed recon mission over North Korea in the Chosin Reservoir area. Weather in the area was marginal and cold. We took off in our F-80s with me in the lead and Willie Wall the element leader.

We arrived over the designated area and let down through breaks in the clouds, began scud running; working our way over very rough terrain, looking for enemy activity and other targets of opportunity. Slipping through a pass in the mountains, I spotted activity wending along a winding mountain road, cut out along a particularly steep drop from the mountain top to the valley below. It was going to be a questionable attack with very limited access for good advantage. I instructed the flight to stay up while I made an exploratory pass.

This I did, coming up the valley with a good head of steam and lined up for a short strafing pass. The layout did not make using my 5" rockets a wise choice. As I pulled off the target, I headed toward a saddle back some 1,000 feet above me. As I approached that exit window, I could see that it was going to be close! It was! I hit the side of the pass just short of success. The impact was pretty violent as I yanked the nose up to hit the slope flat!

Next thing I knew, the bird was still flying, though barely! On impact one of the rockets exploded under the left wing, turning it into a flying mess. I jettisoned the canopy because the cockpit was full of smoke. The blast of cold air was not very refreshing. Wall was on my wing in a flash and advised me to bail out because I was on fire. I responded to hold on and to give me an assessment of the damage.

He advised me that the bottom of the airplane was gone, the engine was hanging down a few feet and the whole underside was ablaze. I opted to stay with the machine as long as possible and to try to make Wonsan Harbor some 80 miles south. I asked Wall to contact Monte Carlo, the Navy task force shelling the enemy shore, and to advise them of the situation and that we were on our way.

I was rapidly shedding parts as I had lost throttle control and could not slow down. Approaching the harbor, I started to let down and prepared the seat for ejection. Wall called for me to slow down as we were nearing 500 mph. As I swooped over the harbor, my left wing was coming apart and at the same time my machine guns began firing for no apparent reason. Then the wing folded and as I went into a wild ride, I pulled the trigger and ejected.

The blast of hitting the air stream at that speed was violent and ripped off all my clothing from the safety belt to my toes. After seat separation, I waited a good long period and then pulled the "D" ring. As the chute deployed, I tumbled through the risers. The rescue chopper pulled alongside as I descended into the water. There was some difficulty getting untangled from the risers; then, I was hoisted out of that cold water and into the chopper. My shoulder was hurt pulling me free from the risers.

We landed on an LST anchored just outside the task force. I was immediately rushed into a hot shower and kept there for almost an hour to stave off hypothermia. I was checked over by the helicopter pilot and he could find no injuries other than that I had a very sore shoulder. Later, I found out that it had been broken.

The next day, I was flown over to the cruiser Manchester which was to be my home for a few days. That afternoon, the battleship Missouri came into the harbor and dropped anchor. I was invited to have dinner with the skipper. I was flown over to that majestic hunk of iron and steel for a very interesting evening. There was to be a salvo exercise at dusk. All ships in the task force, including the Missouri, started rapid fire on cue. When those 16-inchers belched, the ship shook like an earthquake. It was a spectacular event. Then, it was back to the Manchester.

Several days went by, then I was ransomed off to my squadron for a case of whiskey. I returned to base and started flying with a mighty sore shoulder. The memories linger on...

About the Author: Bill joined the USAAC in 1942 as an aviation cadet and served as a flight instructor during WWII. During the Korean War, he flew 100 missions in the F-80 and was honorably discharged from the Reserve with the rank of Major in 1958. He joined NAA as a test pilot in 1953 and became Chief Test Pilot of the Sabreliner Division in 1971. In 1976 he was appointed Division Director of Quality and Reliability Assurance and Senior Division Test Pilot until his retirement in 1980. Bill resides in Mesa, AZ and is the Executive Director of the Champlin Fighter Aircraft Museum.

North American Test Pilots—W. R "Bill" Yoakley

by Chandler "Chan" King

"Pilot in the water!!" This simple phrase ran like a thunderbolt through the radio distress signal system aboard the USS Kearsage while on maneuvers off the coast of California on May 28, 1958. The message also provided the approximate location of the pilot in trouble. Lt JG Dan McKinnon on the carrier took off in his Piasecki HUP-2 twin rotor helicopter and headed for the Gulf of Santa Catalina between Catalina and the Mainland to effect a rescue.

There he found Bill Yoakley resting comfortably in his raft just off Avalon, with all sorts of water craft hovering around and ready to help. When Dan dropped his recovery "horse collar" down, Bill slipped it on and was hauled up through a trap door in the bottom of the helicopter to find a grinning pilot who had just made his first rescue. The craft returned to the ship where Bill was put in sickbay although he suffered no ill effect from his experience.



Photo courtesy of Chandler King

Bill Yoakley enjoying the sickbay hospitality of the USS Kearsage after rescue off Catalina Island.

So! What happened? Bill was flying an F-86L for a series of tests at 45,000 feet and all went well. He, subsequently, dove the plane to achieve Maximum q (air pressure) at Sea Level at maximum speed. Suddenly, there was a power surge, with both RPM and fuel pressure deteriorating and total loss of power. Restart procedures failed to revive the engine so Bill decided to bailout just off the shore of Catalina.

After sending his "Mayday" distress signal and setting the airplane trim to fly the F-86L in the direction of the open sea south of Catalina, he blew the canopy and ejected at 4,500 feet. All survival gear worked perfectly and he climbed into his raft.

The F-86L continued south, made a 180° turn and came back to crash in an uninhabited area on the west side of Catalina Island. The crash investigation found that a Cannon plug had shorted and closed the fuel flow valve to the engine.

The carrier completed the rescue by delivering Bill to the LAD facility the next day by plane. In appreciation of his efforts, Lee Atwood and Raymond Rice extended a warm invitation to Lt. McKinnon and held a reception in his honor. Bill demonstrated the fine performance qualities of the F-100 by taking him for a long flight across Southern California in a TF-100 trainer. Yoakley and McKinnon became good friends.

Bill Yoakley began his flying career in the Army Air Corps from which he was discharged in 1947. He joined the Florida Air National Guard where he flew P-51s until 1948 when the Lockheed P-80s became available. Leaving the Guard in 1950, he volunteered for active duty in Korea.

North American Test Pilots—W.R. "Bill" Yoakley

(continued on page 10)



Photo courtesy of Chandler King

Raymond Rice and Bill Yoakley extending a warm welcome to Lt JG Dan McKinnon during his visit to LAD.

North American Test Pilots—W.R. "Bill" Yoakley
(continued from page 9)

He completed 100 missions in the P-80, including one bailout from a burning aircraft, and was transferred to Luke AFB as a F-51 gunnery instructor and then to Tyndall AFB to fly the F-86D. While stationed there, Bill made regular trips to North American Aviation to bring back F-86s to the base. He became well known around the company and in 1953 was offered a job as a production test pilot. He accepted, staying with the company until he retired in 1980.

While at NAA, he was very involved in all the new jets, especially the F-86 and F-100. He was also engaged in the Sabreliner program and made the first flight in the Sabreliner 65 with E. Myers as copilot and Don Byrnes as flight engineer.

In retirement, he moved to Arizona and became Director of the Champlin Fighter Aircraft Museum. He now lives in Mesa, Arizona and is setting up a new museum which will concentrate on jet aircraft.

About the Author: Chandler King, better known as Chan by his many friends is a North American Aviation living icon. He is one of the six remaining pioneers that followed Dutch Kindelberger and Lee Atwood when they moved NAA from Dundalk, Maryland to Inglewood, California. He has participated directly in all of the early NAA projects. He was witness to the merger with Rockwell and the eventual loss of NAA identity. A writer and a pilot, he authored an authoritative study on the postwar NAA Navion. He is now writing a series of articles on NAA test pilots of which this is the first. Welcome aboard, Chan!



Photo courtesy of Chandler King

Bill Yoakley standing on the wing of an F-80C in 1948 while with the Florida Air National Guard.



Edwards AFB historical photo

The National Committee for Aeronautics (NACA), the predecessor of NASA, frequently used North American's classic fighter plane for a variety of research roles and flight duties. Here is one on the flight line at NACA's High Speed Research Center, which was then located at today's North Base.

Where Have All Our Heroes Gone?

by Edmund Rusinek

When I was growing up in Hamtramck, Michigan in the thirties, my friend and I would make several pilgrimages every summer to the Detroit City Airport. It was about nine miles as the crow flies but that meant crossing fields, railroad tracks, industrial dumps and other harsh sites not usually considered suitable for ten-year old kids. Our parents never knew of these exploits because, if they did, there would be the devil to pay!

The airport was L-shaped with a huge natural gas tank in the inner bend of the field so the airport bracketed the tank from two sides. At that point there was a hole in the airport fence and we would crawl through it. We would wend our way inside the perimeter of the fence until we got to the hangars. This was better than all the candy in a candy store!

We wandered into each building and admired the bevy of beautiful aircraft...the solid Beech Staggerwing, the gull wing Stinson Reliant, the stubby little Aeronca C-2 with no landing gear and two doughnut wheels protruding from the bottom of the fuselage, and the Fairchilds, Monocoupes, and Stearmans. The planes seemed to sparkle, covered in their gorgeous painted fabrics. When some mechanic or plane owner realized we didn't belong there, he would "shag" us out.

We would move to the next hangar and the next until we reached the concourse building with all the airline ticket clerks. There, we would stop at each airline counter and "mooch" airline baggage labels. In those days people were not inclined to fly and each airline had its own routes so the clerks had a lot of free time. Some would wave us off but we usually managed to get several labels from each trip.

We took away from these ventures more then just labels...we took away dreams...dreams of what could be done if only you had the courage to try! This courage was bolstered by a constant parade of heroes...both imaginary and real. Could anyone forget Errol Flynn in the movie *DAWN PATROL* or the endless comic strips such as *Tailspin Tommy* and *Terry and the Pirates*. The flying adventures of *Phineas Pinkham* in *FLYING ACES* magazine spoofed the deadly air battles of WWI where no one died. These were all imaginary heroes but they reflected the real ones with their bravery, patriotism, adventurism and creativity.

There was a bound book in our public library. I don't remember the title of it anymore, but every page contained a sketch of a famous aviator or airplane builder since the Wright Brothers. We took that book out so many times, we almost wore it out. From it, we learned about Glenn Curtiss, Charles Lindbergh, Glenn Martin, Richard Byrd, Sir Hubert Wilkins, Amelia Earhart, Frank Luke, Wiley Post, Floyd Bennett, Eddie Rickenbacker, Billy Bishop, Alexander de Seversky, Igor Sikorsky, Art Chester, Clyde Pangborn, Jimmy Doolittle, Tony Fokker...the list was endless. These were real heroes...these were people worth emulating.

Today, I look around to see who our young people have for heroes to serve as role models and I am shocked at what I see. Is America so void of real heroes that we must turn to crotch grabbing, brain dead rock "stars" that are totally warped on drugs with no voices and less talent? Or, so-called movie stars that threaten to leave this country if someone not of their liking is elected and then never go. Or, sport figures that whine in monosyllables about their multi-million dollar contracts and refuse to serve their country when called upon. Is this human garbage the best that we can provide our young people for role models to be emulated? It would be easy to blame the media for this terrible submersion into mediocrity but I think we must take a look at ourselves and realize that we let it happen!

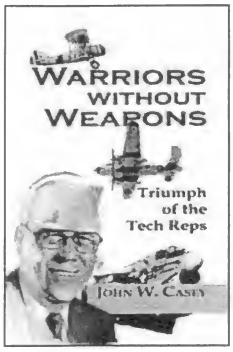
Over the years we have been bombarded with this painted, composed, written and acted puke and told that this is "realism in art" and that civility, morality, patriotism and prayers are no longer needed and are out-of-date. It has gotten to the point that we have replaced our judgment with the opinions of the ACLU and others as the true judges of what is good and what is acceptable. If we protest, we are told that we are bigoted or that we are offending someone or hindering his freedom of expression.

This nation was created by men that stood up for something. It wasn't perfect and is still in the process of improving but it is far, far better than whatever is second best! It also gives everyone the democratic right to speak up and to voice their individual opinion but to act in accord with the majority decision. Today, in trying to please everyone, this nation is slipping into a cesspool of mediocrity that stands for nothing!

Enough is enough. We must stop supporting the perpetuation of this social slag by refusing to attend movies or to view television shows that have no cultural or social value and by not paying outlandish prices for sporting events and rock concerts which breed contempt for politeness, patriotism, ethics and society, itself. Even more importantly, by taking back our obligations in teaching our young people what is right rather than abdicating these responsibilities to these psychopaths that cannot even control their own destinies, much less properly raise their own children. Perhaps, then our real heroes will emerge.

P.S. Are you wondering whatever happened to my childhood friend and me? When we came back from the service, I took advantage of the GI Bill, went to the university for a degree and ended up with a 49-year career in Aerospace. My friend met a girl at the local Walgreen's where she worked behind the soda fountain. He married the girl and became a letter carrier. They had to get married because he was getting fat and going broke from all the chocolate milk shakes he was drinking while courting her. And yes, almost all the airlines of the thirties are long gone now but I still have and cherish my collection of airline baggage labels.





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by John W. Casey

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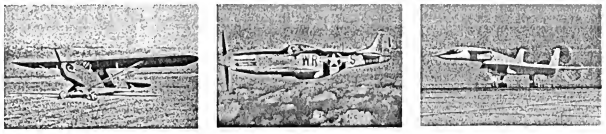
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FOR THE BALD EAGLES 42ND ANNUAL REUNION ON SATURDAY, APRIL 17, 2004

See page 2 for details.

THE TIMES OF MY LIFE
A Pilot's Story
From Piper Cub to P-51 to XB-70
by Al White



The personal story of Al White from learning to fly in a Piper Cub in the CPT Program in 1940, enlisting in the Army Air Corps Aviation Cadet Program and graduating in 1942 to completing two tours of duty over Germany in P-51s to returning home and getting a BS degree at UC Berkley. In 1948, Al reenlisted and became an Air Force test pilot at Edwards AFB. In 1954, he joined North American Aviation as an engineering test pilot. Al flew tests on the T-39, F-86s, F-100s, and the F-107. He was the backup pilot for the X-15 and was the chief test pilot for the XB-70. He made the initial flights of both aircraft until #2 crashed in 1966.

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If you are looking for a book about a hero, this is the book to get! I could not put this book down because it presents the constant drive of the human spirit to accomplish the best that is in all of us. Buy it for yourself or a young one as a gift and ask Al to sign and dedicate your copy!

—Ed Rusinek, Editor



NASA photo by Bill Ingalls

On February 2, 2004, the Columbia Memorial was dedicated at Arlington National Cemetary—one year and one day after the loss of the Columbia and her crew on STS-107. Mrs. Sandy Anderson, wife of Columbia astronaut Michael Anderson, looks at the memorial along with astronauts Steve Robinson (right) and Carlos Noriega (left).

Contrails From The Past

by Ed Rusinek

Dear Ed,

I am enclosing a check for $20.00 to extend my subscription for two more years. I will be 92 years young on February 19, 2004. Hope to live a few more years. I still maintain my 1926 Model T Ford.

—Frank K. Faulkner, Camatillo, CA

Ed's Resp.: God Bless you, Frank! We hope you and your Model T have many, many more years still left!

Dear Ed,

In the Doolittle Raiders group photo in the Winter 2003 issue of the NAA Retirees Bulletin, the unidentified person standing next to Griffith Williams is H. W. "Pinky" Pinkham.

—William "Bill" Dean, Santa Ana, CA

Ed's Resp.: Good eyes! Thanks for the heads up.

Dear Ed,

In the group picture of the Doolittle Raiders in the Winter 2003 issue, the person in the flight jacket and coveralls is Bill Easton. Bill was an NAA test pilot who died on May 10, 1969 in a crash in El Segundo on takeoff in a Douglas B-26 *Invader* being used by Autonetics to gather test data. It was reported that the B-26 had been refueled with JP-4 jet fuel, which caused the accident.

—John R. Boone, Big Bear City, CA

Ed's Resp.: Although sad, thank you for the footnote to this story.



Photo from the Norm Avery Collection

Doolittle Raiders during 1958 visit to the NAA/ LAD facility in front of reworked and renumbered Aircraft No. 40-2344 including Field Service Manager John Casey, Ted Lawson, Engineering Manager Duncan Harding, Howard Sessler, Travis Hoover, Bill Easton, John Hilger, H. W. "Pinky" Pinkham, and Griffith Williams.

Dear Ed,

A good friend gave me a copy of your bulletin. During World War II, I was a crew chief with the 12th Air Force, assigned to "Peggy Lou", S/N 43-27698, a Kansas City B-25J *Mitchell* bomber in the 445th Bomb Squadron of the 321st Bomb Group. It was a fine airplane, well built, and a great bombing platform according to my pilots. I practiced strict preventive maintenance, pulled the inspections without fail and the airplane performed as designed. "Peggy Lou" completed 137 combat missions in ten months and never had an "early return". The airplane was the Squadron, Group and Wing lead plane.

I have recently published a history of the 321st Bomb Group titled **Untold & Unsung...The Unknown**. It includes over 300 action photos. The publisher price is $34.50 but may be ordered from me for $28.85 postage paid. Orders can be sent to: Frederick Lawrence, P.O. Box 376, Wofford Heights, CA 93285.

—Frederick Lawrence, Wofford Heights, CA

Ed's Resp.: Sounds like an excellent history of the B-25 Mitchell in action. We are printing a photo of "Peggy Lou" from your book.



Photo courtesy of Frederick Lawrence

"Peggy Lou" with 137 bombs printed on her side awaiting the next mission. Germany surrendered and it never came.

CONGRATULATIONS and BEST WISHES to

Stan and June Guzy
of Garden Grove, California celebrating their 50th Wedding Anniversary.

John and Vivian Andres
of Maryville, Tennessee celebrating their 50th Wedding Anniversary.

Leonardo and Povindenza Lunetto
of Temecula, California celebrating their 70th Wedding Anniversary.

The Silent Majority

by Stan Guzy

ANDREWS, WILBUR A., 81 – died on November 15, 2003 at his home in Redondo Beach, CA. Wilbur served as an engineer at North American Rockwell for 40 years.

BAKER, WILLIAM E., 71 – passed away on December 11, 2003 in Huntington Beach, CA after contracting pneumonia. Bill had battled lung disease for over twenty years and underwent quadruple by-pass surgery from which he never fully recovered. After receiving a BSEE degree in 1959 he worked in aerospace until his retirement from NAA/RI in 1992. Bill was a devoted family man and was very active in Scouting. He also assisted in Little League, serving as a coach and umpire for many years. Myrna, his wife of 47 years and his extended family survive him.

BALDWIN, RUSSELL H., 92 – passed away on January 4, 2004 from undisclosed causes. He had worked for Bell Aircraft, NAA/RI and TRW as an aerospace engineer, helping to build some of the earliest American spacecraft from Vanguard to the Apollo. He retired from TRW in 1976. Consuelo, his wife of 39 years, survives him.

BARTER, JACOB H., 85 – died on January 11, 2004 at his home in Hemet, CA from undisclosed causes. He had worked for NAA/RI for 34 years until he retired as a manager in 1986. Madelyn, his wife of 65 years, survives him.

BOWEN, PENNY, 72 – died from a pulmonary heart condition on August 23, 2003 in Cocoa Beach FL. He had worked as an NAA tech rep in Korea and Viet Nam during his career at NAA/RI.

BROOKES, SARI, 82 – passed away in Las Vegas, NV on December 12, 2003. She had worked as an illustrator at LAD for many years and retired from the Space Division in 1992 where she was in Shuttle wiring installation design. No further information provided.

BRUNSKOW, ERIK O., 63 – died suddenly on December 23, 2003. Erik had worked on Apollo, Saturn and GPS programs before retiring from the Seal Beach facility in 1999. He is survived by his loving wife of 41 years, Lorraine

COMBS, FLORENCE E., 65 – of Hemet, CA, died on November 26, 2003 at the Corona Regional Medical Center. She had been a planner at the Autonetics Division for 30 years before retiring. Her loving husband, Jimmy, survives her.

CRAMER, DANIEL W., – retired from LAD in 1991 after 42 years of service. Bulletin returned, stamped "Deceased". No further information available.

CRAWFORD, ELSIE L., 90 – died January 5, 2004 in Murrieta, CA of undisclosed causes. She had retired from NAA/RI. No further information provided.

DOWNEY, FRANK W., 71 – died of cancer in Las Vegas, NV on January 22, 2004. Frank hired in the traffic department at LAD as a truck driver. He transferred to Atomics International and then to Palmdale. Promoted to manager of transportation & in-plant trucking, he retired in 1988 after 35 years of service. His wife Ladena, also an NAA/RI 1987 Palmdale retiree, survives him.

ENTSMINGER, JACK D., 78 – died on December 16, 2003 from undisclosed causes at the Inland Valley Regional Medical Center in Wildomar, CA. He was an engineer at NAA/RI and is survived by his wife of 57 years, Emelie.

GREGORY, ROBERT P., 82 – of Mission Viejo, CA died of Alzheimer disease on December 5, 2003. Bob had been a technical illustrator in the LAD advanced design group. Betty, his loving wife, survives him.

HAND, RICHARD L., 77 – died on January 1, 2004 in Springdale, Iowa. He retired from NAA/RI in 1987 after 29 years of service as an engineer/member of technical staff. He specialized in the area of technical writing. Avis, his wife, survives him.

HERMANN, NORMAN E., 82 – died recently at the Sun City Convalescent Hospital in Sun City, CA. Details of his death were not provided. He had been an engineer at NAA/RI from 1954 until he retired in 1982. His wife, Laverne, survives him.

HILL, FRED J. JR., 76 – passed away on November 11, 2003 from a heart attack at his farm home in Pine Bluff, AR. He was a lead engineer for the inertial guidance systems being developed at Space Division. He also flew aboard the B-52 as a missile operator for the Hound Dog (WS-131B) during flight test at Eglin AFB. Fred retired in 1986 after 30 years of service. He is survived by his loving wife, Robby.

HOGUE, ROSE MARY, 82 – died on December 16, 2003 at Los Alamitos Medical Center, Los Alamitos, CA of complications following hip surgery. She had worked in Software Engineering at Downey. She retired in 1984 after 21 years of service. Lewis (Jack), her husband survives her.

JACKSON, GWENDOLYN W., 81 – died December 26, 2003 of undisclosed causes in Plano, TX. She started as a secretary and retired as an executive assistant in the engineering planning group at NAA/RI. No additional information was provided.

JAEGER, WILLIAM H. "BILL", 85 – died peacefully at his home in Huntsville, AL from unspecified causes on January 13, 2004. In 1947, he went to work for NAA in aircraft hydraulics and later became Chief of Customer Relations. In 1956, he was appointed plant manager of the Rocketdyne Division in Neosho, MO. The Neosho plant built the Saturn 5 booster engines. In 1959, he was promoted corporate director of NAA/RI's Huntsville operations which were dedicated to the Apollo Program.

JONES, FRED W., 67 – passed away at home on January 14, 2004 from unspecified causes. After 31 years of service with NAA/RI, he retired to Parker, AZ where he was enjoying his days along the Colorado River. Jean, his wife, survives him.

KASULES, JOSEPH E., 87 – passed away peacefully at his home in Cypress, CA on January 9, 2004. Details of death were not specified. He worked for NAA/RI as a research technician for over 30 years before retiring in 1980. Maxine, his loving wife of 61 years, survives him.

LITTLE, ROBERT S. JR., – of Hemet, CA, passed away on November 20, 2003 in Las Vegas, NV while on a short trip. Although Bob served most of his 28 years at LAD, he retired in 1982 from the Columbus Division where he began his career in manufacturing engineering. His loving wife, Viola survives him.

MATTESON, BEN H., 90 – of La Mirada, CA, passed away on November 11, 2003 of unspecified causes. Ben began his career in Contract Administration at LAD and retired from Autonetics in 1971 after 33 years of service. His loving wife, Mary, survives him.

McCOY, ARTHUR H., 85 – a resident of Bullhead City, AZ, passed away on November 16, 2003 in Las Vegas, NV. Arthur

retired from the Palmdale Facility after 31 years of service. His loving wife, Carol, survives him.

McGOWAN, STANLEY E., 75 – passed away in Torrance, CA of a massive stroke on January 17, 2004. Stan served 24 years at the LAD in engineering flight test instrumentation. He was responsible for the design and operation of computers used in the reduction of flight test data. He is survived by his wife, Barbara.

McHUGH, CHARLES J., 89 – passed away on January 6, 2004 of unspecified causes. He came to the aviation industry in 1942 and worked as an aerospace engineer with NAA/RI for over 35 years. He worked on the Space Shuttle and Apollo mission that landed a man on the moon. His name is in a capsule on the lunar surface.

MIKULS, JOHN A., 92 – died at his home in Hemet, CA on January 29, 2004. He was a model builder at LAD for 30 years. He is survived by his loving wife of 58 years, Barbara.

MOORE, CHARLES A. "CHUCK", 79 – died in Hesperia, CA on January 23, 2004 of cancer. Chuck served in the LAD structures lab for 32 years until he retired in 1981. He is survived by his loving wife, Barbara.

MORAN, EDWARD H., 89 – a retired supervisor at Rockwell International died in La Habra, CA on January 25, 2004 of heart disease. No further details available.

NEAL, WILLIAM J. "BILL", 83 – died after a heart attack at his home in Yucaipa, CA on December 6, 2003. He retired from LAD Plant Protection as a security officer in 1985. His loving companion, Pauline, survives him.

OWSIAN, ANDREW, "ANDY", 64 – of Mira Loma, CA died as a result of a heart attack on December 24, 2003. Andy had worked at LAD in Computer Operations for 17 years. No further information provided.

PEARSALL, KEITH A. "BUD", 84 – died on September 29, 2003 in Prescott,AZ. Bud worked for NAA for 20 years before retiring in 1968. In 2000, he moved to Phoenix, AZ to live with his son, Wayne, and his family.

PETERSON, LAVERN C. "PETE", 80 – of Torrance, CA died on January 14, 2004. He worked in the warehouse for 29 years and was a leadman when he was placed on disability. He retired in 1989. He is survived by his loving wife of 54 years, Omolene.

PHILLIPS, HARRY J., 71 – died on January 17, 2004 at Centinela Hospital in Inglewood, CA after suffering a heart attack. He was an expert in aerospace electronics and worked on many aircraft and rocket programs at NAA/RI/Boeing before retiring in 2002. His wife, Monika, survives him.

PLESCIA, PHILLIP F., 87 – a resident of Anaheim, CA he died on December 8, 2003 of natural causes. As an aerospace engineer/manager he had worked on many production programs including the P-51, F-86 and F-100, the X-15 and the Concorde. Mabel, his wife of 66 years, survives him.

REESE, LOIS, 69 – succumbed to cardiac arrest on December 29, 2003 in Lynwood, CA. She had worked at LAD in El Segundo, CA on the Sabreliner and B-1 programs. She retired from the Seal Beach facility after 35 years of service.

ROBERTS, WILLIAM T. M. "SWAMPY", 81 – died on December 23, 2003 at UCLA Santa Monica Hospital after a long illness. "Swampy" had a technical career that spanned over forty years at NAA/RI on programs including the X-15, the Apollo, the Saturn II, the Space Shuttle and the Space Station. His wife of 55 years, Bobbye survives him.

SCHOEMAKER, ANDREW R., 82 – of La Habra, CA passed away on January 23, 2004. He was a project engineer in LAD on the B-1 wing design and in Downey and Seal Beach before retiring in 1990 after 41 years of service. He is survived by his loving wife of 51 years, Doris.

SCRIVEN, LELAND A., 89 – of Orange, CA died on January 2, 2004 of pneumonia. He was a NAA/RI retiree. No additional information was provided.

SIMONE, JOSEPH D., 79 – passed away on December 3, 2003 at Hoag Hospital in Newport Beach, CA from congestive heart failure. Joe had worked at LAD from 1961 to 1985 as an industrial and plant layout engineer. He worked on the XB-70, Apollo and the B-1A and B-1B. He was a trained architect. Joe served in the U.S. Marine Corps during World War II and was wounded at Iwo Jima. Rose, his loving wife of 54 years, survives him.

STEPHENS, LUCIAN B., 80 – passed away in September 2003 of undisclosed causes. With a passion for flying, he worked for NAA/RI on major projects including the Apollo Space Program. No further information available.

SULLIVAN, CLIFTON R. "SULLY", 87 – died of heart failure on January 14, 2004 at the Kindred Care Hospital in Los Angeles, CA after a long illness. He joined NAA in 1940 at the LAD facility and worked as night shift supervisor in Quality Control for 36 years until he retired in 1976. Mary Ann, his wife of 63 years, survives him.

TEMOYAN, HARRY, 79 – died on February 4, 2004 at the Menifee Valley Medical Center in Sun City, CA. He was an engineer at Autonetics for 30 years. Internment was at Riverside National Cemetery.

WEHMEYER, ARLO E., 72 – passed away on December 6, 2003 after a long bout with cancer. He came to NAA in 1957 where he began his career in the systems and tactics group working on the F-107, F-108 and B-70 navigation subsystems. He moved to the avionics group in 1968, working on the electronic systems design concepts for the B-1 bomber and other programs until he retired in 1987. His wife, Jackie, survives him.

WHATCOTT, VERNON C., 74 – died on January 10, 2004 in Las Vegas, NV of complications resulting from arthritis and emphysema. Vern had lived in Las Vegas since his retirement in 1985. He worked in the thermodynamics group at NAA and made contributions to aircraft projects such as the F-108, XB-70 and the B-1B bomber. Mary Ann, his wife, survives him.

YERIAN, FLOYD R., 73 – died on February 8, 2004 of natural causes at his home in Corvallis, MT. Floyd retired from Space Division in 1986 after 31 years as a manufacturing research engineer.

PAX DOMINI SIT SEMPER VOBISCUM

RETIREES BULLETIN OFFICE
2600 Westminster Blvd.
P.O. Box 3644, M/C SJ51
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North American Aviation Retirees Bulletin

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Photo from the Norm Avery Collection

In 1943, the North American Aviation Production Test Pilots posed for a picture with "Old Bones", B-25H-10 Aircraft S/N 43-5104, the 1,000th and final B-25H and the last B-25 built at LAD. Standing (l to r) Spencer Jennings, Harlan H. "Buzz" Sharman, George Annis, John C. "Jack" Bryan, Paul Torrance, Paul Franklin, Bob Marriot and Paul Balfour. Front Row (l to r) Ted Terry, George Ornstein, Abelardo Rodriguez, Roger Ruud, Leon Indart, Wilcox B. "Tex" Wild, and Dick Chapin. Not present for the photo were George Halsey, Kenneth Dorman, Fred C. Smith and Roy Bodeen. The plane bears the names of thousands of NAA employees involved in the making of the airplane.

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION Retirees Bulletin

Summer 2004

Inside: **"DR. RANDALS, I AM AN ENGINEER"** by Barbara "Bobbie" Johnson
THE SATURN S-II CHRONICLES by William "Bill" Dean and Friends
IN SPACE WITH ONLY A PARACHUTE by Ed Rusinek
BALD EAGLES 42ND ANNUAL REUNION by Lee French



Photo Courtesy of the Boeing History Archives Office

UTILIZING MANY OF THE MANUFACTURING AND ASSEMBLY TECHNIQUES DEVELOPED ON THE NAVAHO PROGRAM IN THE FIFTIES, NORTH AMERICAN AVIATION EMBARKED ON THE MASSIVE DESIGN, ASSEMBLY AND TESTING OF THE SATURN S-II STAGE AT THE SEAL BEACH FACILITY IN THE SIXTIES. THE FIVE SATURN II ROCKET ENGINES ARE IN FINAL CHECKOUT BY ROCKETDYNE PERSONNEL IN PREPARATION FOR DELIVERY TO THE MISSISSIPPI TEST FACILITY (MTF) FOR TEST FIRING PRIOR TO TRANSMITTAL TO THE KENNEDY SPACE CENTER (KSC).

NORTH AMERICAN AVIATION
Retirees Bulletin

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DEAR NAA RETIREE BULLETIN SUBSCRIBER

Over the past few months, many of you have suggested that we widen our topics to cover more than just airplanes. Well, this issue is all about Spaceships and the Space people that made North American Aviation the premier company in the conquest of Space. First, we have Barbara "Bobbie" Johnson giving us some insights on what she had to do to prove that she was every bit as capable as the men in engineering and in management. Her ability to explain complex technical issues in simple layman language won her world recognition from such media moguls as Walter Cronkite.

For Saturn II, rather than a simple historical recitation about the program, we have a series of vignettes assembled by Bill Dean from various individuals that were directly involved, chronicling their experiences on the program. To complete this all Space issue, we added the fantastic story of courageous USAF Captain Joe Kittinger.

THE PASSING OF A LEGEND — WILLIAM "PETE" KNIGHT

California State Senator and former test pilot William J. "Pete" Knight passed away of leukemia on May 7, 2004. After completing his last assignment as Vice Commander of the Air Force Flight Test Center at Edwards AFB, and after 32 years of military service, Knight retired from the Air Force in 1982 with the rank of Colonel.



Photo courtesy of AFTC History Office

Continuing his dream of service to his country, he entered politics and became the Mayor of Palmdale in 1988. In 1992, Knight was elected to the California Assembly and became the State Senator for District 17 in 1996.

Pete Knight is best remembered by the aerospace community as the fastest fixed-wing pilot. His crowning aviation achievement came on October 3, 1967 when he flew the North American Aviation X-15A-2 to an absolute world speed record of Mach 6.7 or 4,520 mph. That record for a fixed-wing aircraft stands to this day. The X-15A-2 was equipped with external fuel tanks, jettisoned at Mach 2, to extend engine run time. The aircraft was completely covered with a protective ablative material that was slowly burned off by atmospheric friction during flight. Flying the X-15 rocket plane fourteen days later, Knight earned his astronaut wings by climbing to 280,500 ft. (above 53 miles) on October 17, 1967.

During his career, Knight tested more than 100 types of aircraft and accumulated more than 7,000 flying hours, including 5,000 in high performance jets. He also flew the North American Aviation F-100 during 253 combat missions over Vietnam.

Not often mentioned in the history books was the fact that in 1962, Knight was one of the first six pilots selected to be an Air Force astronaut for the USAF/Boeing X-20 Dyna-Soar program. Slated to fly in 1965, Dyna-Soar would have given the U.S. a manned space plane sixteen years before the Space Shuttle. However, the X-20 was cancelled in 1963 after only reaching the mockup stage.

Among numerous honors awarded to Pete Knight was the Distinguished Flying Cross (for landing the X-15 without instruments) and the Legion of Merit, both with two Oak Leaf Clusters, and the Air Medal with ten Oak Leaf Clusters.

Knight was enshrined in the National Aviation Hall of Fame in Dayton, Ohio and is one of five individuals recognized in 1990 by the City of Lancaster on the *Walk of Honor*. He served as president of the Society of Experimental Test Pilots (SETP), and received the Octave Chanute award from the American Institute of Aeronautics and Astronautics (AIAA). In 1968, President Johnson awarded him the Harmon International Aviators Trophy for his Mach 6.7 record flight.

Editor's Note: We thank Erik Simonsen of Boeing Integrated Defense Systems for this splendid article on the passing of another of America's legendary heroes. Several years ago, I had the pleasure of meeting the Senator at the opening of the Air Force Museum at Edwards AFB. He was a very approachable and gracious person, willing to share the moment with all those in his company.

NAA/ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Bill Kelley at (714) 637-9374.

The Antelope Valley Retirees Club meets in the South Meeting Room of the Palmdale Culture Center at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell/Boeing retirees are welcome. For information, contact Bill "Tiny" Kisler at (661) 273-0213.

Boeing Valley Retirees Club meets on the 3rd Thursday of each month at the Canoga Park Rec Center, 8500 Fallbrook Avenue, Canoga Park, CA. The president is Jennie Muncaster at (818) 341-8919.

"The Old LAD Stress Group" meets for breakfast approximately every two months at Mimi's Café in Torrance, CA. If you are from the old LAD Stress Group contact Gene Laxton at (310) 378-3113 or Ed Rosenthal at (310) 375-8933.

"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meet at 11:30 AM on the 2nd Wednesday of the month for lunch at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd. and Mariposa Ave.

The NAA 101 Tooling Retirees Group meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at the Cimarron Café, 5160 190th St., West of Anza Avenue in Torrance, CA.

GPS Breakfast Club meets from 6:00 AM to 8:00 AM every Wednesday at the Primrose Restaurant, corner Seal Beach Blvd. and Westminster Blvd. All are invited. For more information, call Fred Shitara at (714) 750-1016.

Seal Beach Retirees Group meets at 11:30 AM on the 3rd Wednesday of the month at "The Fish Co." on Los Alamitos Blvd. at Katella Avenue. For more information call Marvin Blaski at (714) 848-5717 or e-mail to *mblaski@aol.com*.

The Facilities, Industrial Engineering and Plant Services Retirees Group meets at 11:45 AM on the 2nd Thursday of each month at Buster's (formerly Jolly Roger's) Restaurant in the Long Beach Marina. Contact Joe W. Mausser at (562) 596-5845.

Downey Engineering Group of Retirees known as the "Choir Boys" meets every Thursday for lunch at various restaurants from Downey to Seal Beach. Call Al Risi at (714) 892-5725 for meeting location.

"Ye Olde Pharts Breakfast Club" meets at 10:00 AM on the 4th Thursday each month for breakfast at Polly's Pies at 2025 N. Tustin Avenue in Orange. For information call Don Metzger at (949) 495-5374.

The North American Rockwell Retiree Club of McAlester, OK (a satellite of Tulsa, OK) meets at 10:30 AM on the 3rd Tuesday in March, June, September and December at the Down Town Meeting Place. Call J.A. Darden at (918) 423-0706 for more information.

Tulsa & McAlester Retirees meet for breakfast at 8:00 AM on the 2nd Monday in March, June, September and December at the Ramada Inn, 8181 East Skelly Drive in Tulsa, OK. Call Harry Phillips at (918) 838-3716.

The North American Rockwell Retirees Group of Columbus, OH Engineers and professionals meet at 11:30 AM on the 3rd Thursday of each month at the Berwick Park House. Contact Byron C. Solomides at (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH meets at Noon on the 1st Monday of the month at the Whitehall Community Park on North Hamilton Road in Whitehall. Contact E. Hamilton at (740) 927-5940 for information.

Autonetics Group including Marine Systems, Program Office, Project Office, System Test, Engineers and Designers meets for lunch on the last Wednesday of each month at the HomeTown Buffet, Rose Avenue and Alta Vista Drive in Placentia, CA. Call Mike Vohs at (714) 762-1925 for more details.

Autonetics Industrial Engineering and Maintenance Retirees meet for lunch on the 1st Thursday of each month at the HomeTown Buffet, 390 McKinley, located in front of the Home Depot, in Corona, CA. For more details, call Don Burt at (909) 698-0072.

Autonetics Flight Control Retirees meet at 11:30 AM on the 3rd Thursday of each month except in December at The Lamppost Pizza House located at 17568 Yorba Linda Blvd., corner of Richfield Road, in Yorba Linda, CA. Call Jim Anderson at (714) 779-5620 for details.

Autonetics Retirees meet for lunch at 11:45 AM on the 2nd Wednesday of every month at the Rembrandt Restaurant or the Yorba Linda Country Club. All Autonetics retirees, spouses and friends are invited. Contact Robert Nease at (714) 516-1844 or e-mail to *rfnease@email.msn.com* or Ed Venanzi at (714) 779-5652 or e-mail to *EdVennz@aol.com*.

A Group of NAA Retirees meets for breakfast at 8:15 AM on the 1st Wednesday of each month at Knott's Berry Farm-Chicken Restaurant. All are cordially invited. Contact Maxine Haun at *maxi3131@aol.com*.

Autonetics Financial Luncheon Group meets for lunch at Noon on the last Wednesday of the month at Marie Callendars, 126 East Yorba Linda Boulevard in Placentia. Contact Ken Cantwell at (714) 970-7171 or *Kcantwell@adelphia.net*.

A Group of Engineering Mgt. meets at 11:30 AM on the 3rd Tuesday of the month for lunch at Denny's on Imperial Hwy. and the 57 Fwy. Call Ed Moran at (562) 697-9949 for information.

NAA Tech Reps Assn. (TRA) Breakfast Club meets at 9:00 AM on the 1st Tuesday of each month at the Carlsbad Airport Restaurant. For more information, call El Presidente Rafael Colunga at (760) 940-0525.

Material Group retirees from Downey and Seal Beach meet at 11:30 AM on the 4th Wednesday every month at the Stox Restaurant at Imperial Hwy. and Bellflower Blvd. in Downey. Contact Marian Nielson at (562) 429-1020 or Joan Dominguez at (562) 865-7200 or e-mail to *tatedom@aol.com* for information.

Rockwell Vandenberg AFB Retirees Breakfast Club meets at 8:45 AM on the 2nd Tuesday of each month at the IHOP restaurant in Santa Maria. Contact Marv Bailey at (805) 929-6652 or Al Finley at (805) 937-3690.

ANNUAL EVENT

The Hangar Gang – meets at the Proud Bird approximately every 4 months. For time, date and other details, call Gene Salvay at (818) 788-3974 or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

Flight Test Instrumentation Annual Reunion – meets annually at the Fullerton Elks Club. For information, call Frank Vigil at (562) 691-0236.

Tech Rep Association Picnic – A group of retired Field Service Technical Representatives has a yearly picnic in June at a park in Fallbrook, CA. For more information, call TRA President Rafael Colunga at (760) 940-0525 or e-mail to *rafael@nctimes.net*.

The Annual M&P, P.D.L., "Friends Christmas Luncheon" – This group of retirees and employees have assembled in mid-December for a festive luncheon and gabfest for the past 20 years. Those wishing to participate and receive notice of the next December luncheon, call Fred Koeller at (310) 545-8854.

NAA-K B-25 Reunion – will be held on Sunday, August 15, 2004 from 1:00 PM to 5:00 PM at the Wyandotte County Museum in Bonner Springs, KS. For more information, call Harry J. Desko at (913) 287-7223 or write to him at 3024 N. 47th St., Kansas City, KS 66104.

Grants Pass 25th Anniversary Picnic – will be held on Wednesday, September 8, 2004. Contact Bob Morse for details at (541) 474-1438 or e-mail to *lindabob2@earthlink.net*.

NAA Flying Horsemen will hold their reunion on Friday through Sunday, September 17 through 19, 2004 at the Eskaton Lodge in Grass Valley, CA. Contact Harry Shapiro at (714) 993-3496, fax (714) 993-1208 or e-mail *shapsplace@aol.com*.

To have your group or function listed in the CALENDAR OF EVENTS, please send the information to the NAA Retirees Bulletin including identification of the group, date(s) of the event, location including address and name of contact with phone number and e-mail. Send to NAA Retirees Bulletin, 2600 Westminster Blvd., P.O. Box 3644, M/C SJS1, Seal Beach, CA 90740.

"DR. RANDALS, I AM AN ENGINEER"
The Bobbie Johnson Story

by Barbara "Bobbie" Johnson

Editor's Note: When I came to Downey in 1951, it seemed that the only technical positions available to women were as draftswomen and as mathematicians filling out endless tables of data on Friden calculators. One day, I attended a technical meeting and there was a very savvy lady engineer conducting the session. It was Bobbie Johnson. This is her story…

In October 1946, I had my 21st birthday on the train heading to California for my first engineering job. When I arrived at NAA/LAD, I remember walking through a very long empty hangar to a stairway at the other end. The Aerophysics Laboratories group was up those stairs. Frankly, I was very apprehensive about the whole thing! I was one of 4 or 5 new engineering grads assigned to the group headed by Dr. Bill Bollay. The unit was both prestigious and unique. I estimate that more than half of the staff had PhDs, also there were several German scientists from the WWII era.

Originally, I was hired to work on a rocket test stand project but the contract was still pending. I was assigned to the Aerodynamics Group under Dr. Bill Randals. I was to report to Dr. Bruno Augustine along with another new grad. Bruno was involved in his own research and really didn't want anyone reporting to him. He told us to look busy for a while. We played "Battleship". After about two weeks of this I went to Dr. Randals' office. He had his back to me with his feet on the desk. I said, **"Dr. Randals, I am an engineer and I want a real engineering assignment."**

He didn't say a word for a moment, then started laughing and left the room. I thought I was going to be fired. Then Bill returned with Dale Myers and introduced us. Dale said, "I understand that you want a real engineering assignment. I have one. Report to me Monday morning". That was the beginning of my engineering career at NAA.

My first assignment was the internal design, using the method of characteristics, for a supersonic inlet. This led to the G-26 inlet for the Navaho ramjet missile.

In 1948, the Aerophysics Laboratories was moving to Downey. About the same time, the rocket test stand design contract was approved. Dale told me that I could transfer to his group and that he could offer me more money. I immediately decided to go to Downey. It was somewhat of a shock to see the Downey facility still covered in WW II camouflage.

On the Navaho program I became involved in the external aerodynamics and flight mechanics. I calculated the first G-26 boost trajectory and flight conditions at 2 second intervals, using only my slide rule. The booster performance requirement was to end boost at flight conditions compatible with ramjet ignition.

Using the REAC analog computer, three of us worked all night running Climb to Cruise trajectories. The end result was the development of the allowable end-boost flight envelope combination of altitude, velocity and vehicle attitude for ramjet ignition.

I was unaware until much later that this envelope was referred to as "Bobbie's Box". I was late for an Air Force meeting and as I walked into the room, I heard an Air Force colonel mention "Bobbie's Box". Without thinking, I said, "I'm Bobbie". After an uneasy moment, we all laughed. The colonel had just asked before I walked in if the vehicle was instrumented to recognize if the end-boost flight conditions were within allowable limits.

Some of the studies I worked on included several aerospace planes, a paraglider for recovery of a second stage booster, lifting bodies and missile interceptors. Among my supervisors were Toppy Pearce, Harold Bell and Hank Webb. They all taught me a great deal about aerodynamics and system performance. I was also deeply involved in the Hound Dog preproposal effort and on the actual proposal. I recall developing a matrix of the various aerodynamic and engine configurations being considered. After we got the contract, Dale Myers asked me to go on the program. However, by this time I was heavily committed to work on BOLO, a terrain clearance vehicle.

A delegation of NAA engineers went to Wright-Patterson AFB to complete the work statement for the Hound Dog. At the same time, Bert Taylor, our lead on the BOLO study, had initiated TAs for himself, Gary Gould and me to go to Wright-Patterson to report on our progress. All of our TAs went in at the same time, including mine for B. C. Johnson, and were routinely approved. There had been an unwritten rule which did not permit women to travel for the company. This rule always irritated me especially when I had to frequently brief others to report on studies which I had completed.

After arriving at Wright-Patterson, we successfully dodged the other NAA people at the hotel, restaurants and the base. However, the next day, a colonel who was aware of my involvement on the Hound Dog proposal, asked me to brief some officers during the Noon hour regarding Hound Dog performance. Even though this was not on our BOLO agenda, I naturally obliged. There were about twenty officers and they all had many questions.

On the flight home, we congratulated ourselves on how well we had avoided being seen by our counterparts. On Monday morning there was a note on my desk to see my director. When I got to his office, he showed me a directive received that morning stating that any woman traveling for the company must have her TA signed by the president or the vice-president of the division. The colonel had mentioned my impromptu briefing to someone. However, this broke the travel barrier for all women in the company.

Upon receiving the Apollo contract, about thirty of us went to Williamsburg, Virginia to sign the contract/work statement. Weather forced our flight to terminate in Cleveland. This didn't bother me too much because on the flight I was squeezed in the middle seat between Marty Kinsler and Charlie Feltz. After waiting a couple of hours, we boarded a Greyhound bus which John Paup had chartered. At the time, I reported to Earl Cole. Everyone on the bus was asleep except Earl and I. He was still thinking about the work statement. Finally, I suggested that he turn off the light because it might be disturbing the others. At 5:00 AM we stopped at the Washington D.C. bus station for a rest. Everyone was a wrinkled wreck with bloodshot eyes and the fellows were unshaven. We arrived at Williamsburg at 8:00 AM, just in time for our scheduled meeting!

A real thrill for me was a trip to JSC for the Apollo 11 atmospheric entry and splashdown. I was looking through the windows into Mission Control when Chris Kraft motioned me in to sit in the VIP Section. This was my best trip. That experience ranks above the honor of introducing Vice President Hubert Humphrey when he visited Downey and working with Walter Cronkite during his visits.

The day after Yuri Gagarin made his orbital flight, my director called me in and said, "Bobbie, learn all there is to learn about reentry". By this time I was classified as a specialist. I studied all the reports I could find on the subject: NASA, Air Force and some German and British publications.

Later, when we were starting to work on the Apollo proposal; Deloy Olsen, Mark Hasthun and I went to Langley. We worked night and day, writing down everything we learned. Norm Ryker was directing much of the proposal effort. The technical part of the proposal was limited to 100 pages. I was responsible for the flight performance and the aeroheating section of the proposal and we were limited to one page of the 100. Putting all that information on one page was a struggle.



Photo from the Bobbie Johnson Collection

Engineering Manager Bobbie Johnson briefs Vice President Hubert Humphrey on the Space Shuttle Program during his visit to the Space Division in Downey.

I don't think that any of us, at least in the technical area, thought that we would get the Apollo contract. We had not had any of the Phase B studies. Needless to say, we were all ecstatic when we did get it! I didn't care why we got it. I only knew that I wanted to be a part of it. The Apollo program was an inspiration to all of us. There were a few skeptics and they soon disappeared.

My assignment was supervisor of the Entry Trajectory and Performance unit. We developed the system (subsystem) performance requirements, design trajectories for the heat shield, flight envelopes for loads assessments, footprints for primary and alternate "splashdown" sites. Being very dynamic, the group grew to about twenty engineers. I recall telling two lead engineers, Art Frank and Elvin Knotts, that we probably knew more about hypervelocity atmospheric entry than anyone else in the country!

We simulated the primary guidance which pre-empted the need for back-up guidance in case of primary guidance failure. Art Frank came up with a visual concept or entry monitor system. It was a graphic display whereby the pilot could monitor the primary guidance trajectory and take over manually in the event the flight conditions exceeded the limits indicated on the monitor.

Using the Range-To-Go information on the display, the pilot could then maneuver to the general location of the intended landing area. Since this was somewhat radical at the time, it took a great deal of effort to convince program management to use this graph display or X-Y plotter. However, the astronauts' approval was all it took and Autonetics got the contract.

We were very active in support of the Flight Technique Panel under Bill Tindall. This body concentrated on how to fly the mission, considering failures, abnormal situations etc. We reviewed all sorts of "What if?" conditions. I recall being in a flight techniques meeting just before Apollo 11, where Neil Armstrong asked, "Bobbie, is the EMS going to work?" I was nervous in a way I never felt before. On a previous flight, an EMS accelerometer had misbehaved. Having reviewed all the actions taken by Autonetics to resolve the problem, I answered, "Yes, Neil, it's going to be O.K." Post-flight analysis substantiated my answer.

In 1967, I became a manager, replacing Mike Vucelic. My group numbered approximately 120 people spread over seven units including: Ascent Performance, Descent Performance, Life Sciences Support, Flight Plans and Procedures, Flight Test Requirements and Evaluation, Systems Operations Analysis, and Systems Requirements. Later, we added an eighth unit for the J-Mission, Scientific Experiments. My staff included a proven trouble shooter, Tom Shanahan and a capable Margaret Chase to keep top management informed on the latest lunar mission activities. My group was substantially increased in number when the Air Force Apollo CSM program under Lynn Tinnen was merged with the NASA program under George Jeffs.

Affirmative action programs were emphasized during the early '70s. The Company was frequently asked to provide a professional (technical) woman employee to speak to various women's organizations, at high school and college career development programs and on civic panels. I was the "token" woman for these activities. They were somewhat of a "pain" because they required preparation. However, I did find a great deal of gratification in thinking that perhaps I enlightened some students on what was available if they trained.

Also, in the '70s, the Company became concerned that the engineers may unionize. The Chief Engineer asked all directors and managers to speak to their groups, dissuading the vote for the union. I remember repeating many times, "This is a people oriented company". I felt strongly that it was and was pleased when the engineers voted not to unionize.

Just prior to Christmas of that year, the Company had a blanket workforce reduction. I was told to layoff people immediately. This meant that they would not receive their paid vacation week at Christmas. I couldn't understand this, since I had contractual coverage for all of my people. I discussed this with my supervisors and told them, "I don't want to coerce anyone, but I'll sign all vacation requests". The response was overwhelming. The VP of Engineering was more than a little angry with me. After the vacations, everyone was back at work. We received new budgets for the Apollo J-Missions and I was soon writing "Request to Hire" forms.

During the Seventies, the manned lunar program had substantially lost its luster throughout the country and in the Congress. Technology was no longer popular. We all remember the massive layoffs which happened at the time. It was the worst of times for all of us.

After the Apollo CSM programs—J-Mission, Skylab and Apollo-Soyuz—the Shuttle Program seemed somewhat tame. There were many challenges, such as re-use, turn-around time, etc. but they were not key to my activities.

However, I do remember the Systems Requirements Review (SRR) three weeks exercise as quite an experience. Fred Haise and I, with our support people spent long, fruitful hours on this project. We deleted some unnecessary requirements, instigated some needed studies to better understand some of the requirements and identified some items needing programmatic decisions. At the time, Fred was the NASA Technical Assistant to the Manager, Orbiter Projects.

One thing I will always remember about the Shuttle is the word *"Squatcholoids"*. It is a word developed by Roger Oglvie of the Ascent Performance Unit. It's a descriptive name for the shapes of flight envelopes for structural load evaluation and is still in use.

In late 1979, I was assigned to work as program manager for a proposal to provide on-site shuttle flight operations support to the NASA, Johnson Space Center. It was an enlightening experience. I had all of the elements of the company—finance, facilities, purchasing, etc.—and I was literally getting "brainwashed" with all the details. As part of the proposal, we formed a subsidiary of the Space Division with the name "Spaceflight Operations Inc., A Subsidiary of Rockwell International". The people helping me were excellent. Each week I would brief senior management on the items where we had to "bite the bullet". This organization now exists and is operating in Houston. In the meantime, I went on vacation and returned, only to go immediately on medical leave, and subsequent retirement.

The great undertaking of the Apollo Program coupled with the position I held, brought me fame, if not fortune, so to speak. I had received many medallions, awards and recognition from technical societies, universities and honorary fraternities. I have even signed autographs. My picture appeared in *TIME* Magazine (May 24, 1968). On November 22, 1997, long after my retirement, we had a big group reunion. There were well over 100 people from all parts of the country. Many I hadn't seen in more than twenty years. I think it was the highlight of my career. It is the people that I miss the most!

The Saturn S-II Chronicles

by William "Bill" Dean and Friends

Some time ago, Ed Rusinek asked me to provide a write-up of the Saturn S-II Stage Program for inclusion in the NAA Retirees Bulletin. Rather than write another "history" of the program, I asked the S-II team members for some of their recollections, serious as well as humorous, of this highly successful, twelve year long endeavor. I think you will enjoy the following. - Bill Dean

The S-II Proposal Presentation at Huntsville
– Bill Schleich

Our S-II Proposal had been submitted to NASA and the Missile Division, as we were known then, was requested to give an oral presentation at NASA/MFSC in Huntsville, Alabama. It was the summer of 1961. Following all the heavy proposal activity, I took my family on vacation to Illinois where I was called to go immediately to Huntsville. My wife, Jackie, our daughter, Kristin (2 years old), and I arrived in Huntsville on an evening after the local NAA office was closed. In all my previous trips to Huntsville on the S-II program, the Missile Division always booked us in the Holiday Inn which was very near the NAA office.

Arriving late, I went to the Holiday Inn and was told there were no reservations in my name. The desk clerk said, "I'll see if I can find out where North American is staying now". He located our reservations across the street at the Sands. I found out the next day that the Holiday Inn had erroneously sold the room they had reserved for Lee Atwood. The NAA Huntsville office had reacted by moving all North American Aviation bookings and business away from the Holiday Inn. In all the later trips I made to Huntsville I don't remember ever staying at the Holiday Inn again.

I was participating as the proposal team Flight Technology Manager. The team was led by Bill Parker and Paul Wickham. Lee Atwood and Harrison Storms were there to attest to Corporate and Division support. The major challenge of the S-II was its size, 33 feet in diameter, and a low weight requirement as a second stage required a high mass fraction. The liquid hydrogen fuel was low in density and, therefore, required a large volume tank in comparison to the liquid oxygen tank. A unique feature of our proposal was the common bulkhead separating the LH2 fuel from the LOX. Thus, structures, manufacturing and propulsion were the emphasis areas. I was along just in case a Flight Technology subject surfaced.

Our briefing followed that of our competitor, McDonnell Douglas. We were waiting outside the briefing room in a hall and the presenters were all busy talking together and mentally rehearsing. I found myself standing with Lee Atwood as he observed this activity. He related that the proposals for a new airplane were run differently. The plane was designed then a prototype built and there was a competitive fly off. Mr. Atwood was not too impressed by the flip charts and models made for spacecraft.

The briefing went fine and during some questions and discussion Wernher von Braun asked, "How did you select the coast type separation of the S-II from the first stage, the S-IC? Did you consider 'fire in the hole'?" I thought, "This is why I am here", so I stood up and described our trade studies and selection. We had conducted parametric studies of several variations of coast separation and 'fire in the hole'. We chose the coast separation as the most desirable scheme from a standpoint of maximum mission payload, simple for reliability, tolerant to thrust tail off and ignition dispersions and minimizing explosion hazards. Von Braun then asked, "Did you consider a dual plane separation of the Interstage structure?" The Interstage structure mated the first stage to the S-II. I answered that we had studied dual plane separation and that we realized that it would provide a performance advantage but we had not incorporated it because of the added complexity of a second separation plane and clearance concerns as the Interstage departed from the aft end of the S-II. Soon after we received the contract from NASA in October 1961, we received a directive from the MSFC S-II Project Office directing an additional study of dual plane separation. After the study, dual plane separation was adopted. The camera image of S-II separation (shown quite frequently in space vehicle launches on TV and in the movies) shows the S-IC first stage receding in the background as the Interstage structure separates and leaves, illuminated by the plume of the five J-2 rocket engines.

More on that Camera System
– Hank Dinenno

On one of the very early Saturn V flights, we were flying a camera system to film the dual plane separation of the S-II from the S-IC. The camera was located in a tube in the aft skirt of the S-II. After filming the separation of the S-IC from the Interstage and then the Interstage from the S-II, the cameras were to be ejected by pneumatic pressure right through the J-2 engine start plume. After it had descended to a predetermined altitude, a barometric switch was to trigger a parachute system and the camera and film were to be recovered in the open sea by helicopter. Premature ejection of the camera would be like sending a torpedo into the forward bulkhead of the S-IC and could make for a really bad day.

Late in the countdown we discovered a problem in the electronics of the camera eject system which could cause this premature ejection. We removed the cameras from the vehicle and found the problem in a trace on a printed circuit board. We came up with a solution using a hardwire jumper that would fix the problem. Lloyd Stephens, the launch site engineer, and Ken Hayakawa, the design engineer in California, agreed on the fix but there was no time to go through the formal approval cycle. I talked with Frank Cummings in Engineering Design management in California, we agreed to make the fix and reinstall the camera. After we made the modification, our QC and NASA QC refused to approve it. They said they couldn't buy off on the fix since there were no officially released drawings or EO's. Dr. Kurt Debus, the NASA KSC site director, sent Dr. Hans Gruene over to the Vertical Assembly Building to see what was going on. After Dr. Gruene reviewed the situation, he looked at me and asked, "Will it work?" I replied, "Absolutely". He then asked if I would have Lloyd Stephens redline the drawings to reflect the fix we made and if I would sign it. I said I would. He then told our QC and the NASA QC that if they wouldn't stamp the work, he would personally authorize it and allow reinstallation of the camera on the S-II. They stamped the paperwork, the system was checked on the bench, and installed



NASA Photo

on the vehicle just prior to the start of cryogenic tanking. If the repair had taken much longer, the mission would have been flown without the camera and since no later vehicle was equipped to accept the camera, there would have been no film coverage of this important historical event. The launch went off on schedule and the system performed flawlessly.

Now every time you see a Hollywood film that shows a rocket leaving the earth's atmosphere and a separation of the first stage with the earth growing smaller in the background, remember this story about how it almost didn't happen. Thank you Dr. Gruene. Weren't the good old days great?

Unique Challenges for Manufacturing
– Marv Blaski

A good friend of mine, Mike Davis, was the lead engineer for the ordnance equipment, new hi-tech equipment that never failed to perform. Linear shaped charges cut the vehicle skins successfully for separation and igniters started the solid propellant motors. Fortunately, the linear shaped charges were never needed to terminate the flight. The development program for these highly explosive devices must have been "interesting".

A few years ago, I went to the Bald Eagles Reunion at the Proud Bird Restaurant. I sat next to the manufacturing engineer in charge of the common bulkhead. I don't recall his name but he had an interesting story about the development:

"The common bulkhead was a real state-of-the-art advancement. The common bulkhead had a dome shape and was 33 feet in diameter, with a honeycomb core. It was designed to survive liquid hydrogen exposure (about -23 degrees F) on one side and liquid oxygen exposure (about -297 degrees F) on the other side, all in conjunction with flight acceleration and vibration. The initial step was to explosively form six gore sections for each face and then weld them together to form the 33-foot diameter bulkhead faces. NASA MSFC thought this was a difficult task – and it was. They hired a consultant to help us, but NASA didn't tell the consultant how big the bulkhead was. He arrived at our facility and took one look at what we were doing and left…he had never worked on any similar process beyond three feet in diameter. Fortunately, between the manufacturing engineer, the process engineer and the design engineer we built and used all the bulkheads successfully."

Excitement on the Quality Assurance Night Shift
– Tony Lira

I remember the night that Manufacturing Test was running a hydrostatic test on the LH2 tank for the S-II vehicle. I can't recall which vehicle number it was. I was the QA supervisor on that shift. It was about 11:00 PM and something happened that caused the Forward LH2 Bulkhead to implode. The Project Engineer assigned to the 2nd shift wanted me to call out Ralph Eaglen, QA Director (I refused and he told me that he would see that I was reprimanded). Instead I called John Ronnigen, my Manager, and he arrived within the hour. He instructed me to impound the Inspection Test Record. I did so and handed the records over to my management the next morning.

We all figured that the LH2 tank was a goner, that is, everyone except Ralph Ruud. He got with A.C. ("Slim") Van Leuven, the Manufacturing manager, and the wheels started rolling. Within hours Ralph Ruud and Slim Van Leuven had instructed the Tooling Department to make a platform that would fit inside the LH2 tank at the sixth floor level, after Manufacturing had trimmed the forward or upper bulkhead at the weld line.

Within days the Forward LH2 bulkhead had been trimmed off and the wooden platform was constructed and placed inside the LH2 tank at the upper level. That platform was a Tool Design engineering marvel. Manufacturing began preparing the weld line of the LH2 tank for a new bulkhead. The X-ray group was responsible to assure that the weld line did not contain any defects or inclusions. We set up two X-ray machines in tandem and X-rayed the entire circumference. This procedure was implemented and approved by the Safety group because time was of the essence. Mel Cole and Dino Toigo reviewed all of the films with Ron Bishop until everyone was satisfied that the weld area was ready for re-weld. I remember very clearly how Ralph Ruud, Slim Van Leuven and Bill Ahern stayed well into the nights while the rework was underway. I once told Ralph Ruud that he was the highest paid manufacturing leadman in the history of North American Aviation/ Rockwell International (you will all recall that at the time he was the Vice President-Manufacturing out of Corporate offices).

In later years I would remind him of our achievements at the Bald Eagle meetings and he would acknowledge that it was one of his better decisions. Another figure that stood beside Ralph Ruud and Slim Van Leuvan was an engineer whose name was Dino Toigo. It was his job to determine what the welded joint could withstand as far as strength ratios considering that the aluminum surface had already been subjected to one weld and that a new weld would be made over the old joint.

The new bulkhead was prepared and joined with the LH2 tank. The weld procedure began, making sure that the surfaces were properly aligned. Product Inspection performed the weld joint alignment check to assure that the offset dimensions of both surfaces did not exceed the allowable tolerances set by Weld Engineering. I remember that Ralph Ruud told Tool Design to create an alignment clamp that would be placed within the weld joint to keep the weld joint surfaces properly aligned and could be removed as the welding process progressed.

The new Forward LH2 bulkhead was welded satisfactorily and subjected to a new hydrostatic test and it passed with flying colors. As I look back now, this was a challenge that was resolved by the close workings of a dedicated group of people working together from top management, to dedicated engineers down to the manufacturing mechanics, test technicians and inspectors. We were quite a group and this relationship continued throughout the entire S-II program.

Don't Forget the "Tinkle" Test
– George Phelps

Foreign materials inadvertently left in a liquid hydrogen or liquid oxygen tank were the makings of a disaster. Before transferring the S-II stage from the manufacturing cell/station to the test and checkout cell/station at Seal Beach, we used to do a "tinkle test." The test involved removing the stage from the manufacturing cell, suspending it by cables from the lifting devices at the front and rear of the stage, rolling it 360 degrees and listening for any sounds of debris that might have been left in the hydrogen and oxygen tanks.

If we detected sounds of debris "rolling around," we had to return the stage to its manufacturing cell, re-open and re-enter the tanks to locate the loose debris/objects. Most of the time what we found were small screwdrivers, keys, crescent wrenches, ball point pens, etc. Of course, returning the S-II stages to the manufacturing cell, re-entering and inspecting the inside of the tanks cost a lot of time and money—man-hours and schedule.

At the time, I was the Director of Configuration Management and System Safety, and Hal Raiklin was the Program Manager. Hal asked me to look into the problem and come up with a solution. What I found was that no inventory was being taken of the tools needed to do work inside the tanks, or of personal items in the pockets of the technicians and inspectors, either upon entry or upon leaving the tanks. And many people were entering and leaving the tanks all day long, each and every day the tanks were in their manufacturing cells, and that went on for weeks at a time.

I reported this and suggested that we establish an inventory control system for entry and exit of the LOX and LH2 tanks, and that a policy be established that no personal "hardware" be allowed to be taken into the tanks, even the identification badges and their

tethers. This was done, and we passed the very next "tinkle" test with "flying colors"! And we passed all the "tinkle" tests thereafter. A common-sense solution and the discipline of the workers involved in its implementation saved time, money and perhaps even lives.

Manufacturing Work at Mississippi Test Facility
– Don Binns

One memory that I recall, was early in the program when Bob Westbrook and his crew found that we had stringer cracks inside the Hydrogen Tanks. I was Joe Goss' assistant at the time and got elected to take a crew from Manufacturing and Inspection to NASA's Mississippi Test Facility (now Stennis Space Center) to rework the vehicles down there. There was an airline strike so H.W. ("Pinky") Pinkham got me a DC-3 to take the crew to MTF. After a crew rest stop in El Paso and an unscheduled trip to Juarez for "supplies", we arrived at MTF and immediately went to work on the vehicle.

It took us 40 hours to finish the job and then we returned to the motel for some rest. I slept about 4 hours when Joe Goss called and said that Bob had found some more places inside the tank that needed repair. I had no clue as to the whereabouts of my crew. I started to look around the motel for them but they were nowhere to be found. Since we were close to New Orleans, I figured that they had gone there for some R and R.

But, I noticed that there were some guys playing football on the beach and went to see who it was. Turned out to be my crew playing football and consuming the "supplies" that we have gotten in Juarez. I "alerted" them and we returned to MTF and completed the repairs required. There were many dedicated people on the program and they all gave more than a 100%. Maybe my most memorable moments on the S-II Program were the people and program itself.

More MTF Recollections
– Bill MacVicar

I was a very junior member of the S-II program team. I graduated from college in 1962 and went to work for NAA. My personal assignment was in the GSE group, designing fluid distribution systems for the S-II test stands. I worked in that group until late 1966 and have some good memories of those days even though I was at the bottom of any totem pole. Time and mergers moved on and I'm now at Boeing Huntington Beach.

One special memory I have is watching the S-II-T ship out of Seal Beach for the Mississippi Test Facility. My camera was extra busy that day; it was a unique occasion. Another very vivid memory I have was being inside the oxygen tank of that same S-II-T stage while it was MTF. I thought I smelled smoke and got out as quickly as I could and hustled off the test stand. I found out a bit later that there was indeed a fire, or at least a lot of smoke from some smoldering wiring or insulation. Of course it was repaired and work continued, but the event and possible consequences were sure embedded in my memory.

On a more humorous note, I recall seeing a memo from the Chief Engineer (but signed by someone else for Paul Wickham) chastising the engineers for gathering around the coffee machines. I see that memo almost every day here in Huntington Beach. Someone (on the Shuttle Program, I think) had posted it as a reminder of how times have changed…for good or bad, you decide.

Proof That She's a Strong Bird
– George Phelps

Before putting man-in-the-loop, we made test flights to assure the Saturn V stages would perform as designed. During the flight of the S-II-2 in April 1968, the #2 engine shut down due to a malfunction that was detected by the on-board computers. The #3 engine also shut down. Yet, at the time, the #3 engine had shown no signs of having any problem.



Photo courtesy of the Boeing History Archives Office

The Saturn S-II Booster being raised at Mississippi Test Facility (MTF) in preparation for a test firing in the Sixties.

The vehicle had been designed to structurally withstand a one engineout condition. Now, we had two engines shut down, and the vehicle was still flying and was remaining, structurally intact. The engines were designed with a gimbal capability to allow the vehicle to maintain a nominal flight trajectory by changing the thrust direction to accommodate any deviations in the planned trajectory that might be caused by such things as wind shears, CG changes due to fuel consumption, etc.

The three remaining functioning engines went to their maximum "hard-over" gimbal positions to get the vehicle back to its planned trajectory. At one point, the vehicle had keeled over to the point that it was practically flying horizontal rather than vertical. Amazingly enough, the remaining engines were successful in "righting" the vehicle, and returning it, almost, to its planned trajectory, and completed the mission.

During an "around the world" telecon, with NASA Headquarters, KSC, MTF, JSC, NAA Downey and Rocketdyne—all the "greats" and "near greats" on line—the telephone operator who had set up the conference call from Florida, came on the line and said, "I have to leave now. I have a hair appointment" and proceeded to terminate the call! Fortunately, we were able to re-establish the call about an hour later.

Of course, the NASA and contractor team went into action to try and determine just what had happened, and why. Well, we, in California, spread out schematics and block diagrams on the floor of a conference room, and got down on our hands and knees to read these documents in an attempt to isolate the problem. I will never forget the Manager of Reliability, Bernie Botfeld, who, within 15 or 20 minutes, came up with, what turned out to be, the correct answer!

The #2 engine ASI (Augmented Spark Igniter) line had ruptured—this line was used to ignite the LOX and Hydrogen fuels as they entered the engine combustion chamber. This failure was detected

by the on-board computers and the computers commanded the engine to shut down. Now, the way the engines were shut down was to close the LOX and Hydrogen engine pre-valves, thereby, starving the engines of propellants.

The reason that the "normal" #3 engine had shut down was due to the fact that the engine pre-valves had been "cross wired."

What we discovered was that the pre-valve(s) electrical circuitry was supposed to be verified for each individual pre valve. Since that was a rather long, extensive, test, it was decided at the Seal Beach Test Facility that the pre-valve individual circuit tests would be deferred and performed in available schedule time at the Mississippi Test Facility.

At MTF, the pre-valves were "gang tested" for electrical continuity, but individual testing of the pre-valves was once again deferred and passed on to KSC to save schedule time. At KSC the pre-valves were "gang tested" but the individual testing was "waived" and not done.

OK, now we launched, and the ASI line rupture occurred, etc. It was determined that the ASI line failed due to "flow induced vibration." The design fix included securing the ASI lines with a bracket to mitigate the vibration problem, and to never defer the individual testing of the rocket engine pre-valves. Go figure!

Now, Let's Go POGO!
– Bob Fleenor

During the first few years after transferring to Huntsville from Downey as an S-II project engineer, I encountered situations that increasingly set my teeth on edge. Not only were we, the on-site NAA reps, getting criticized by Marshall Space Flight Center NASA personnel for problems that were being uncovered on the S-II Stage, but non-government, co-located support engineers were criticizing us as well. At that time in my career, appreciation of, and dedication to, North American were deep, and hearing criticism from non-government personnel was tough to take.

Early in the flight test program, a potentially catastrophic problem was uncovered. A dynamic instability, nicknamed POGO, involving the propulsion and structural subsystems had to be resolved before flights could resume.

An urgent, high-level meeting was held at MSFC, attended by POGO experts from government and industry with Dr. Wernher von Braun as chairperson. Emotions were rising as the problem was detailed but few suggestions were being proffered to resolve it. Several increasingly vitriolic comments were made by the attendees, with Dr. von Braun only listening, identifying NAA as inadequately contributing to problem resolution, and seemingly not that concerned about it.

Here was I, far down the organizational chain, looking around the packed room for someone from our corporation to rebut at least the concern accusation, but silence prevailed. I hesitatingly stood to my feet – still in awe of von Braun – and said, "We are very concerned about this problem. Our best people, along with contracted experts, are working night and day to resolve it. We do indeed care and a fix will be found!"

Dr. von Braun looked me in the eye for a second, and calmly responded, "I believe North American Rockwell is contributing. Let's everyone focus on resolving the problem and stop finger pointing". And fix it we did.

POGO Causes an Engine Shutdown
– Jerry Florey

When viewing the Apollo 13 movie for the first time, I got major goose bumps when during the launch phase, the cast enacted the incident wherein the S-II-8 Stage's center J-2 engine shutdown prematurely caused by high amplitude, low frequency oscillations of the propulsion/structure system, POGO. In the movie, a young dude looking at a CRT display in the Houston Flight Control Center quickly made a proclamation that everything would be OK and they could "go for TLI" (i.e., Trans Lunar Injection). In reality, that young dude was me, except I was in the HOSC (the Huntsville Operations Support Center) and in contact with Houston via a closed circuit voice net. The source of my "OK" was one of a multitude of What-If-Analyses that we had prepared prior to launch. This particular analysis was a nomograph prepared by Bud Brux. It allowed me to determine, depending on which engine and when a premature cutoff occurred, whether or not the Saturn V launch vehicle could make TLI. It included how much longer the S-II would perform with only 4 of its 5 engines operating (in this case 34 seconds) and how much of the S-IVB third stage flight performance propellant reserve would be consumed to make up for the loss of performance of the S-II stage. The nomograph was right-on!

The engine support beam vibration exceeded the theoretical maximum capability for a short duration but no structural failure occurred. Corrective action for the next flight was the addition of a POGO suppression accumulator in the center engine liquid oxygen feedline to decouple the engine performance oscillation from the structural support beam.

One of Those "Explosive" Experiences?
– Hal Raiklen

"Who? What? Where? When? How?" All of these questions were my under-breath explosions!! Why? An acrophobic explosion had occurred!! Let's go back in time.

A friendly KSC guide was taking me to the top of the Apollo/Saturn stack. It was a beautiful Florida day. I wanted to see what it looked like from up there (looking down and out). As we rode up, we noted a panel had been removed from the S-II. "Let's stop and look in," I said. "O.K." was the answer. We made the interim stop, and walked along the catwalk to the opening. I peeked inside, but it was too dark to see anything. "Let's move on!", I said.

There was no reply. I very carefully turned my head and looked behind me. There was no one in sight! Not a soul anywhere!! "Oh my Gawd!" My acrophobia exploded!!! I literally froze but I don't know how long.

Finally, I asked myself, "What's next?" "How did I ever get into this situation?" "Forget those questions," I said to myself. "More importantly, what should I DO next?" Then it suddenly came to me, "What would a spider do in this situation?" I laid down flat, face down. Closed my eyes and crawled backwards, inch by inch. After an hour (or perhaps less) I was back on the platform again! I sprang up and headed for the elevator – down. FREE AT LAST, AGAIN!!!!

Guest of Honor?
– Jerry Florey

At the Apollo 14 Launch, as a recipient of the Space Division Engineer-of-Year Award, I had just settled in as a guest-of-honor in the launch viewing stands at KSC. Suddenly, the loud speaker called my name and instructed me to come to the Launch Control Center. The Propellant Inductance Gauge used in loading the S-II propellants had failed. With Rodger Burg helping, we generated the instructions into proper launch-countdown format and developed an alternate loading procedure, using propellant point sensors and a timer. This real-time procedure worked great and saved us several days of launch delay. The launch was successful. There were no meetings, procedure reviews, etc. How times have changed!

Wasn't So Funny After All
– Bill Dean

The final review (of many) prior to a launch was the Flight Readiness Review conducted at KSC by senior NASA leaders. The FRR concluded with NASA KSC Director, in this case Rocco Petrone, calling on all NASA managers and contractor program managers for assurance that their Saturn stage or Apollo system was ready for launch. By Apollo 16, the FRR's were going so smoothly as to

Saturn S-II Chronicles
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In Space With Only A Parachute

by Ed Rusinek

I went through my 46-step checklist, disconnected from the balloon's power supply and lost all communication with the ground. I was totally under power from the kit on my back. When everything was done, I stood up, turned around to the door, took one final look out and said a silent prayer: "Lord, take care of me now". Then, I just jumped over the side.

As part of the early U.S. Space Program, on August 16, 1960, USAF Captain Joseph Kittinger, wearing a thin pressure suit and breathing supplemental oxygen, ascended in a balloon named *Excelsior III* to an altitude of 102,800 feet and exited from the open gondola into the -100°F near vacuum environment of space.

Within seconds, his body accelerated to 714 mph in the thin air, approaching the speed of sound. Free falling for more than four and a half minutes, slowed by friction as the air became denser, his parachute opened at 14,000 feet and he drifted gently down to the New Mexico desert floor.

Joseph Kittinger grew up near Orlando, Florida. At a young age, he persuaded pilots at a local airfield to give him free rides and soloed in a Piper Cub at 17. Joining the Air Force, he earned his wings in 1949 and served as a NATO test pilot in Germany until 1953 when he was assigned to the Air Force Missile Development Center at Holloman AFB in New Mexico.

At Holloman, Captain Kittinger flew experimental jet aircraft and participated in aerospace medical research. In 1955, he flew a T-33 observation plane that monitored the rocket sled experiments of aero medicine pioneer Col. John Paul Stapp in which Stapp exposed his body to high g-loads.

Stapp recruited Kittinger for *Project Man High* which used balloons and pressurized capsules capable of high altitude flight to study cosmic rays and to determine if man was physically and psychologically capable of extended travel in a space-like environment.

Using a two million cubic foot, 172.6 foot diameter balloon and an aluminum alloy capsule manufactured by Winzen Research of Minneapolis, Kittinger made the first *Man High* ascent on June 2, 1957, climbing to 96,000 feet in a sealed gondola and remaining aloft for almost seven hours. The knowledge acquired from this flight and two more in 1957 and 1958 made by Major David Simons and Lt. Clifton McClure proved invaluable in NASA's *Project Mercury*.



USAF Captain Joseph Kittinger in front of his open gondola shortly before his epic ascent into Space.



USAF Captain Joseph Kittinger seconds after departing from the gondola at 102,800 feet, his body accelerating to 714 mph.

In 1958, Kittinger moved to *Project Excelsior* conducted by the Escape Section of the Aeromedical Laboratory at the Wright Air Development Center. There, he investigated the use of a parachute to escape from a space capsule or high altitude aircraft. His first high-altitude jump came close to being his last one. In November 1959, he bailed out of a balloon at 76,000 feet, the highest anyone had ever been in an open gondola. His small stabilizing chute, which was to prevent a flat spin that could be fatal at rotation speed of 150 to 200 rpm, opened prematurely and wrapped around his neck and caused him to spiral uncontrollably. As he tumbled at 120 revolutions per minute, he lost consciousness. At 12,000 feet, his main chute opened automatically, slowed his descent, and landed him safely. Three weeks later, he jumped from 74,700 feet, setting a free-fall record of 55,000 feet before pulling his parachute ripcord.

On August 16,1960, Kittinger prepared to surpass the altitude record set by Major David Simons, who had climbed in 1957 to 101,516 feet in his *Man-High* balloon.

We got up at 2 AM to start filling the balloon. At 4 AM I started breathing pure oxygen for two hours. That's how long it takes to remove all the nitrogen from your blood so you don't get the bends going so high so fast. Then it was a lengthy dress procedure layering warm clothing under my pressure suit. They kept me in air-conditioning until it was time to launch because we were in the desert and I wasn't supposed to sweat. If I did, my clothes would freeze on the way up.

How was the ascent and how long did it take?

It took an hour and a half to get to altitude. It was cold. At 40,000 feet, the glove on my right hand hadn't inflated. I took a calculated risk, that I might lose use of my right hand. It quickly swelled up, and I did lose use for the duration of the flight. But the rest of the pressure suit worked. When I reached 102,800 feet, maximum altitude, I wasn't quite over the target. So I drifted for 11 minutes. The winds were out of the east.

What was it like at that altitude?

You can see about 400 miles in every direction. The most fascinating thing is that it's just black overhead—the tran-

sition from normal blue to black is very stark. You can't see stars because there's a lot of glare from the sun, so your pupils are too small. I was struck with the beauty of it. But, I was also struck by how hostile it is: more than 100 degrees below zero, no air. If my protection suit failed, I would be dead in a few seconds. Blood actually boils above 62,000 feet.

What happened after you jumped over the side?

I rolled over and looked up, and there was the balloon just roaring into space. I realized that the balloon wasn't roaring into space; I was going down at a fantastic rate! At about 90,000 feet, I reached 714 mph. The altimeter on my wrist was unwinding very rapidly. But there was no sense of speed. Where you determine speed is visual—if you see something go flashing by. But nothing flashes by 20 miles up—there are no signposts there, and you are way above any clouds. When the chute opened, the rest of the jump was anticlimactic because everything had worked perfectly. I landed 12 or 13 minutes later, and there was my crew waiting. We were elated.

What was the outcome with your right hand?

It hurt—there was quite a bit of swelling and the blood pressure in my arm was high. But that went away in a few days, and I regained full use of my hand.

Captain Kittinger's flight and parachute jump demonstrated that, properly protected, it was possible for an airman to exit his aircraft at extremely high altitudes and free-fall back into the Earth's atmosphere without dangerous consequences.

Editor's Note: Although, this saga has nothing to do with NAA/Rockwell, we thought the courage, heroism and panache demonstrated by Captain Kittinger was worthy of being told again to remind all of us what America is all about. Captain Kittinger continued performing balloon ascents at Holloman AFB then volunteered for three combat tours in Vietnam, flying 483 missions. On May 11, 1972, he was shot down and spent 11 months in captivity. He retired from the USAF in 1978 with the rank of Colonel and entered balloon competitions. He won the Gordon Bennett Gas Balloon Race four times in the 1980s and was the first person to solo across the Atlantic Ocean in a balloon. He is currently living in the Orlando, FL area but, we suspect, far from being retired.

Saturn S-II Chronicles

(continued from page 9)

be routine, and the oral responses to Rocco's calls for assurance were almost rote. As if to prove again that idle minds are the Devil's Workshop, Earl Dean (no kin to me), Boeing's Program Manager for the S-IC stage, and I decided we would pull Rocco Petrone's chain a bit by answering for each others stage. So, when Earl was called upon, I said "S-IC ready for launch" and, in turn, Earl said "S-II ready for launch". Of course, Rocco recognized our voices. He turned around, glared for probably a full minute at the two of us sitting side by side with straight faces, considered what to do, then turned back and continued the FRR. Rocco never brought up the incident, and we certainly never repeated it.

The Spool Piece Lives On
– Bob Weaver

The Apollo Program decided to order a set of facility checkout hardware to verify the Launch Complex 39 to Saturn V interfaces. Due to minor development problems the S-II facility check-out stage would not be able to meet the rigorous schedule. A substitute was devised, two circular steel pieces the diameter of the S-II connected by a small diameter cylinder the length of the S-II. The item naturally was called the "spool piece". The spool piece was mated on schedule to the first stage and the upper stages. This imaginative solution allowed the facility interfaces to be verified and corrected where required before delivery of the flight stages. At a gathering honoring Rocco Petrone's work at KSC, and promotion and transfer to NASA Headquarters as head of the Manned Space Flight Office, Al Martin presented Rocco with a model of the Saturn V stack with a scaled spool piece inserted in place of the S-II stage. A roar of laughter erupted when Al read the words inscribed on the base, "S-II ready for launch, Rocco". Of course the S-II flight stages, the most complicated and efficient of the stack, went on to be successful during all launches.

The Last Mission
– Bill Dean

In the early 1970's, NASA developed a concept for deploying an experimental space station, to be known as Skylab. Skylab consisted of a "dry" S-IVB, the third stage of the Saturn V rocket, modified to accommodate a three man crew and equipped with a number of scientific instruments and supporting hardware. The launch vehicle was an S-IC and an S-II, with the S-II modified to serve both as a booster and as the vehicle to inject the Skylab into earth orbit. Many modifications were required to be designed, manufactured, installed and tested on a very tight schedule using an award fee type contract. The outstanding success of the re-engineering and production effort and subsequent launch of Skylab on May 14, 1973 was highlighted by NASA granting, for first time ever to one of its contractors, 100% of the contract award fee.

The Saga of the S-II Interstage on Skylab I
– Gale Waite

On May 14, 1973, the S-II Quick Data Review and Technical Support teams were assembled in Huntsville, Alabama. The Skylab launch went off on schedule at 13:30 hrs. The S-IC performed as expected with the five S-II engines starting at S-IC/S-II separation. Shortly after launch, problems with the meteoroid shield and the #2 solar array on the Skylab absorbed everyone's attention.

At that moment, my Thermo engineer whispered in my ear, "We had a high temperature measurement in the Aft Skirt on the S-II. I think the Interstage is still attached." A check of the event instrumentation indicated that the Interstage did, in fact, separate. So for several hours, the debate went on, "Did it or did it not separate?"

The next morning we were all again assembled and concerns about the Skylab made the S-II/Interstage issue a low priority. About midday, an Air Force officer came in and asked for me. He wanted to know if I was the one who wanted to resolve the Interchange mystery. I answered, "Of course!" He asked me to follow him.

We took a car to another building which had armed guards at the door. We were met by another officer who asked me if I saw a picture of the S-II Stage in orbit, could I tell if the Interstage was still attached. I replied that I could but I wondered if such a picture was possible.

We went up an elevator and down a hall to another door with armed guards. I was told that what I was about to see was classified and who I could share this information with would be determined later. Inside, a projector showed the S-II in a tumbling mode and when it came to a broadside view, the projector stopped. Not only could I see that the Interstage was still attached but that it was cocked at an angle. It was clear that the linear shaped charge designed to cut it free had failed to propagate more than half the circumference, but enough to get the event indication of separation.

It was later reported that post-flight telemetry data revealed the problem. However, I realized that in 1973 we already had the capability of taking some very sophisticated pictures of objects in space.

The 42nd Bald Eagles Annual Reunion—April 17, 2004

Photos by Lee French



Charter member Al Purcell at the Proud Bird enjoying the Curtis P-40 similar to the one he flew in the Army Air Corps. Al was hired by NAA in 1935 in Dundalk, Maryland and retired after 46 years of service.



Jim Albaugh, Val Yarbrough, and Sam Iacobellis



Charter Members - Al Purcell and Julius Kany



Test Pilots - Keith Taylor, Bill Yoakley, Jim Brooks, and Al White



Ann Tack and Bev Gresham



Ed Rusinek, Stan Guzy, and Lee French



Michael Juarez, Nelson Slagle, and Tom Stodgel



Robert Hunson, Dick Culleton, and Gene Salvay



Harold Raiklen, Bill Bright, and Dennis Koziol



Irv Altneu, John Peller, and George Jeffs



Charlie and Ny Chin, Don Koons, and Sharron Brundige



Kiyo Nakagawa, Kimi Taira, and Bette Addington



Dave Baker, Cathy Boot, Jo Tranchina, John Tranchina, and Joe Onesty



Pete Verdin, Larry Pearson, and Val Yarbrough



Joe Mausser, Charles Wendell, Gerald McGee, and Pat Cunningham

Contrails From The Past

by Ed Rusinek

Dear Ed,

I am a 35 year retiree from Rockwell International. I started with NAA in 1959 on the Hound Dog program at Downey. After working on many programs, I ended my career in 1995 on the B-1B and the C-130 Gunship Flight Test Program at Edwards AFB. I noticed that every issue of the Bulletin references programs before 1960 and the people involved in them. I rarely see articles about North American Rockwell or about the retirees unless it's in the Silent Majority. I enjoy every issue, but I was curious why so few articles are written about the '70s and '80s. Thank you for letting me express my feelings and opinions for what little they are worth!

—Gilbert Lozano, Lancaster, CA

Ed's Resp.: Your feelings and opinions are very important to us and we thank you for letting us know what you want to see in the bulletin. Unfortunately, we do not always have the volunteer authors to cover all programs and all divisions. We are still searching for authors from Rocketdyne, Autonetics and Seal Beach.

Dear Ed,

The Spring 2004 issue of the Bulletin is the best ever.

—Charles Lowry, Garden Grove, CA

Ed's Resp.: Thanks Chuck. As the world's finest authority on parachute systems, how about writing an article for us?

Dear Ed,

It's been a great year for me, celebrating the 50th Anniversary of the Pinewood Derby. As the founder, I have written a book about the history of the Pinewood Derby and it is available for a special price of $15.00, including handling and postage. Please send your requests to: Don Murphy, 3030 Merrill Drive, #43, Torrance, CA 90503.

—Don Murphy, Torrance, CA

Ed's Resp.: Congratulations Don! Everyone that had a boy in Cub Scouts remembers the excitement and thrill of making and racing a Pinewood Derby racer. Your creation also sparked a lot of long nights for dads, after the boys went to bed, trying to figure out how to make the cars run faster!

Dear Ed,

The Apollo 13 article, Winter 2003 issue, brought back a lot of memories of that day. I was at home when the news broke that there had been an explosion and the crew was moving into the LEM. Many of us in Crew Systems came to work that night and stayed for several days. We knew that the lithium hydroxide canisters in the LEM used to remove the carbon dioxide would only last a few days. Somehow we had to adapt the larger canisters used by AiResearch for the Command Module ECS to the Hamilton Standard ECS used in the LEM. We came up with the technique using cardboard and duct tape. We then wrote out the procedure as carefully as possible to allow transmission of the information to the crew with no visual aids to help them. After a demonstration to Chris Kraft and Gene Kranze, we sent the instructions to the crew, informing them to use the lunar landing flight plan books for the cardboard. The adapter was very successful in allowing the crew to remain in the LEM until it was time to activate the Command Module for entry. The time spent in the LEM was very uncomfortable and cold but they were able to survive.

—Larry E. Bell, Friendswood, TX

Ed's Resp.: It was three days in which the entire world stopped and watched an amazing engineering miracle.

Dear Ed,

Al Blackburn's identification of Jim Brooks as the pilot of the rocket assisted F-86, Winter 2003 issue, reminded me of a photo I still have from LAD Flight Test of some of the test pilots. Incidentally, all of these pilots flew engineering test flights out of LAX under direction from the NAA Hangar 7 Control Tower at the west end of the field.

—C. Hank Bauer, Cape Canaveral, FL

Ed's Resp.: Thanks for sharing it with us.



Photo Courtesy of C. Hank Bauer

Front (L to R): J. Ray Donahoue, Jim Brooks, Dan Darnell and Al Blackburn. Rear (L to R): Ray Morris, Al White, Bud Poage, Bob Baker, Bob Hoover and J. O. Roberts.

North American Aviation Historical Archive

If you have been wondering about the history of NAA and if anyone is trying to save it—the answer is yes! Boeing has an extensive world class history program that includes historical archives for the preservation of company papers and artifacts. A growing part of our history program is the NAA/Rockwell Historical Archive which now includes most of the historic film, photography, engineering drawings and technical manuals as well as a good collection of the *Skywriter* and *Skylines*. We also have the complete set of Board of Directors meeting minutes and, just recently, we acquired a few years of Lee Atwood's executive correspondence. The archives are used by the company to support its business, but are also open to the public. School kids, scholars, writers, film producers and others from around the world visit us to do research. The NAA Archive is still in need of materials to make it as complete as possible. Anyone who has artifacts, records or anything else of interest related to NAA/Rockwell that they would like to donate to this valuable resource, are invited to contact me at (425) 865-3798, or e-mail *michael.j.lombardi@boeing.com* or Pat McGinnis at our Douglas Archives in Cypress, CA at (714) 229-7472.

—Michael Lombardi, Historian, The Boeing Company

CONGRATULATIONS and BEST WISHES to

Marvin and Ann Beeson of Murrieta, California
celebrating their 50th Wedding Anniversary

Don Murphy of Torrance, California
in celebration of the 50th Anniversary of
his origin of the Cub Scout Pinewood Derby

John and Ellen Paul of Escondido, California
celebrating their 60th Wedding Anniversary

The Silent Majority

by Stan Guzy

BARRETT, RICHARD D., 81 – of Mission Viejo, CA died on April 21, 2004 of a heart attack. Dick was a technical writer at LAD.

BERRY, HAROLD F., 88 – passed away from natural causes on October 8, 2001. Harold joined NAA/LAD in 1941 and retired in 1976 after 35 years of dedicated service.

BERSICH, BERNIE, 76 – died on August 11, 2002 at his home in Cypress, CA from declining health. He had served as a NAA Tech Rep on the F-86 fighter for many years. He was also Past President of the NAA Technical Representatives Association.

BRANCH, KARL, 75 – died March 24, 2004 at Sutter Auburn Faith Hospital after a brief illness. Karl worked as a software engineer on major projects including the Space Shuttle main engines and the Space Station before retiring in 1992. An enthusiastic trombonist, he played with the Rockwell Band in Los Angeles, CA.

BROWN, ORAL KENNETH, 85 – died in Newport Beach, CA on February 22, 2004 of pneumonia. He worked at several divisions for 43 years before retiring. His wife, Betty Brown, survives him.

BRUBAKER, DALE, – died of cancer in October 2003. Dale worked in fuselage design, engineering standards and, finally, in materials and processes when he retired.

COWART, FRANK – renewal postcard returned marked "deceased". Frank had worked at Rocketdyne for 37 years and retired in 1978.

CRAWFORD, ELSIE L., 90 – died January 5, 2004 of undisclosed causes in Murrieta, CA. She was retired from NAA/RI.

DELP, DONALD S., 78 – died on December 2, 2002 in Scottsdale, AZ from internal bleeding with complications. He had retired from the B-1 Division in 1985 after 24 years of service. He is survived by his loving wife, Ann Marie.

ENTSMINGER, JACK D., 78 – died on December 16, 2003 in Wildomar, CA of undisclosed causes. He retired as an engineer at RI. He is survived by his wife of 57 years, Emelie.

ESPINOSA, DAVID V., 85 – of Anaheim, CA died of natural causes on March 16, 2004. He had worked as a material handler at RI before his retirement. His loving wife, Helen, survives him.

FLANAGEN, ISAAC W., 95 – died on February 26, 2004 in Nipomo, CA. He retired from Autonetics engineering management. Burial was in Church Hill, Tennessee.

FRICK, DOROTHY L., 91 – passed away on March 16, 2004 in Salem, OR of undisclosed causes. She had been an accountant in the Cost Section of Accounting when she retired in 1975.

HEIMER, FRED C., – subscription renewal card returned marked "deceased" from Athens, WV.

HERMANN, NORMAN E., 82 – died January 5, 2004 in Sun City, CA. Norm worked as an electrical engineer at NAA/RI from 1954 until he retired in 1982. His wife, LaVerne, survives him.

HODGES, EDWIN T., 86 – died of pneumonia on March 5, 2004 in Fullerton, CA. He was in engineering management and was a member of the Radio Club for many years. His wife, Betty, survives him.

HOLTE, ANFIN "ART", 90 – died at his home in Vista, CA on January 10, 2004. Art began his career in 1941 at LAD where he met his wife. Art retired in 1976 after 35 years of service. His loving wife, Edna, survives him.

HORTON, IVY M., 83 – died May 2, 2004 of a heart attack. Ivy had been a supervisor in human resources before retiring in 1983 with 33 years of service. Bill, her loving husband of 61 years, survives her.

KING, PAUL D., 81 – of Cypress, CA, died of natural causes on March 7, 2004. He was in engineering management prior to retirement. His wife Judith survives him.

KIRBY, WILTON K., 91 – died on February 10, 2004 in Sun City, CA. He worked as an engineer on the Apollo ram jet engines prior to his retirement. His loving wife, Mildred, survives him.

KNOBEL, FRED W., 89 – died March 1, 2004 at home in Riverside, CA of undisclosed causes. He had worked as a machinist on the B-1 test models and the Space Shuttle program. His wife, Ordema, survives him.

LAW, ERVING G., 76 – of Yorba Linda, CA, an aerospace engineer and attorney, died on April 20, 2004 after a long illness. He retired in 1988 as a project manager but returned as a Flex Force employee for an another 3 years before retiring again in 1993. His loving wife, Caryn Marie, survives him.

LECCESE, VINCENT H., 74 – died in Long Beach, CA of cancer on February 26, 2004. Vincent worked in manufacturing operations management at LAD, Palmdale and in St. Louis, MO.

LYNCH, HELEN L., 62 – of Santa Ana, CA, died of a heart attack on March 14, 2004. She worked as an electronic assembler at NAA/RI before retirement.

MAXWELL, ROBERT D. "BOB", 83 – died on March 24, 2004 at home in Camarillo, CA. Bob worked as an electrical engineer for 47 years at Downey and at Autonetics prior to retiring in 1995. He is survived by his wife of 58 years, Maxine.

McINTYRE, DONALD, 76 – died on April 14, 2004 in San Marcos, CA of Parkinson's disease complications. Don began his career at NAA/LAD as an engineering draftsman in 1948. Moving to the Space Division, he became a project manager in the Apollo and Space Shuttle projects prior to his retirement in 1984. He is survived by his loving wife of 28 years, Nancy.

MEAD, GEORGE, 75 – died March 10, 2004 of undetermined causes. He worked in engineering prior to his retirement. Interment services were held in New York.

MENG, EUGENE D., 80 – died unexpectedly at his home in Huldenberg, Belgium of undisclosed causes. Gene joined the Autonetics Marketing Department in 1955 and was appointed director of field offices in Dayton, OH, Oklahoma City, OK and Houston, TX before joining the NAA European Marketing office.

MORAN, EDWARD H., 89 – died on January 25, 2004 of heart disease. He was an art supervisor prior to his retirement.

NATION, DONALD J., 78 – of Anaheim, CA died of pulmonary disease on April 8, 2004. He was a supervisor at Space Division.

OLIVER, RAYMOND B., 81 – of Fullerton, CA, died after a lengthy illness on December 8, 2003. Ray began at NAA in

1948 and retired in 1984. He had worked on the Navajo, Saturn S-II, Space Shuttle and other projects. His devoted wife, Rebecca, survives him.

OLSEN, ROBERT P. "BOB", 82 – died peacefully of undisclosed causes on February 8, 2004 in San Luis Obispo, CA. A metallurgical engineer, he worked on NAA space programs including the X-15 development, Apollo and Space Shuttle projects until he retired in 1985.

OLSEN, VICTOR L., 83 – passed away in October 2003 from undisclosed causes in Prescott, AZ. He joined NAA in the early 1950s and served in program management, budgeting and business applications before retiring in the 1980s.

ORSBURN, DOUGLAS K., 86 – of Fullerton, CA died of lung cancer on February 16, 2004. Doug served in Logistics Management at Autonetics for many years. His wife, Sue, survives him.

PENNOCK, JOHN L., 72 – died on January 28, 2004 at West Hills Hospital near Agoura Hills, CA. John retired from Rocketdyne after 35 years of service at Huntsville, AL, White Sands Proving Grounds, NM and Canoga Park, CA. His wife Vivian survives him.

PRIME, ELLIS R., 88 – died on January 5, 2002 of congestive heart failure in Stanford, CA. He worked in the metallurgical applications area at LAD for 27 years prior to his retirement in 1970. His devoted wife of 59 years, Rita, survives him.

RHODES, JAMES E., 75 – died on November 13, 2003 of undisclosed causes in Lancaster, CA. Jim worked as a mechanic in Flight Test Operations at Edwards AFB and at Plant 42 in Palmdale, CA.

SANCHEZ, FRANK L., 78 – died March 19, 2004 of a heart attack. He had worked as an engineer for NAA/RI/Boeing. His wife, Alberta, survives him.

SCHAEFER, NORMA JEAN, 82 – died on March 9, 2004 in Corona, CA. Cause of death was not disclosed. Norma had been a NAA blueprint clerk at Downey, CA for 20 years before she retired.

SCHWARTZ, IRWIN L. "IRV", 76 – passed away on April 10, 2004 in Woodland Hills, CA of complications due to cancer. He retired in 1990 after 18 years of service as a process engineer in the materials and producibility at LAD. His loving wife, Jo Anne, survives him.

SCOFIELD, WARREN L., 83 – a resident of Bixby, OK, died of a stroke on January 26, 2004 in Tulsa, OK. He had worked for 35 years as an engineer and manager on the F-86, X-15, XB-70, Apollo, B-1 and Boeing 757 at LAD and Palmdale before retiring from Tulsa.

TEMOYAN, HARRY, 79 – died on February 4, 2004 in Sun City, CA. After WWII, he worked for NAA/RI as an aerospace engineer for 30 years before retiring from Autonetics.

THAYNE, DONNA (PLANCHON), 72 – died on March 5, 2004 of cancer. She worked at NAA/RI for 32 years before retiring. Richard, her husband of 51 years, survives her.

TRUMAN, HUBERT "PETE", 77 – died on May 6, 2004 of a heart attack in Columbus, OH. He retired after serving 35 years in Contracts at the Columbus plant. He is survived by his loving wife of 52 years, Donna.

VAN LEUVEN, ALBERT C., 87 – passed away on March 1, 2004 in Palm Springs, CA. Albert had served in a managerial capacity at NAA/RI for 29 years. He is survived by his wife of 65 years, Frances.

WALKER, ROBERT B. "BOB", 92 – passed away in North Pitcher, NY on November 11, 2003 of undisclosed causes. Bob came to NAA in the late 30's. He enlisted in the U.S. Army Corps and served from 1941 to 1946, achieving the rank of Lt. Colonel. On special assignment, he worked with Wernher von Braun in Scottsdale, AZ on the Atlas, Ajax and Titan designs. He received several awards for his work on the X-15, B-70 and B-1B programs.

WEBBER, EDGAR R., – died December 20, 2003 of natural causes. He was an engineer with NAA/RI/Boeing for 35 years. He is survived by his wife of 61 years, Dorothy.

WEST, WILLIAM J., 83 – of St. George, Utah, died from complications attributed to an infection. He worked as a physicist for NAA/RI/Boeing for several years. His wife, Helen, survives him.

WIENER, HARRY R., 67 – died on December 24, 2003 in Huntsville, AL of undisclosed causes. He began his engineering career at NAA/El Segundo, CA. In 27 years, he was promoted up the corporate ladder to Site Director of the Huntsville Facility where he retired in 1996. He is survived by his devoted wife, Rita.

WILSON, EVERITT J. "ED", 76 – of Calimesa, CA died on November 18, 2003 of cancer at Loma Linda Medical Center. Ed worked as a facility engineer at Space, Autonetics and Lakewood, retiring in 1988 after 28 years of service. His loving wife of 44 years, Marcella, survives him.

WURZER, GERALDINE, "GERRIE" – died of cardiopulmonary arrest on October 16, 2003 at her home in Torrance, CA. She worked as a design engineer for 47 years before retiring. Starting at LAD, she transferred to the Space Division to work on the Apollo and Space Shuttle projects.

WYTHE, FREDERICK K., 90 – died on March 11, 2004 of recurrent pneumonia. Fred retired in 1968 after 25 years of service as an industrial engineer. After retirement, he moved to Florida, Oxnard and Pacific Palisades before settling in Van Nuys, CA. Estelle, his loving wife of 65 years, survives him.

YOUNG JR., WILLIAM E., 82 – died on December 31, 2003 in Orange, CA of undisclosed causes. He worked in quality control.



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Photo from the Bobbie Johnson Collection

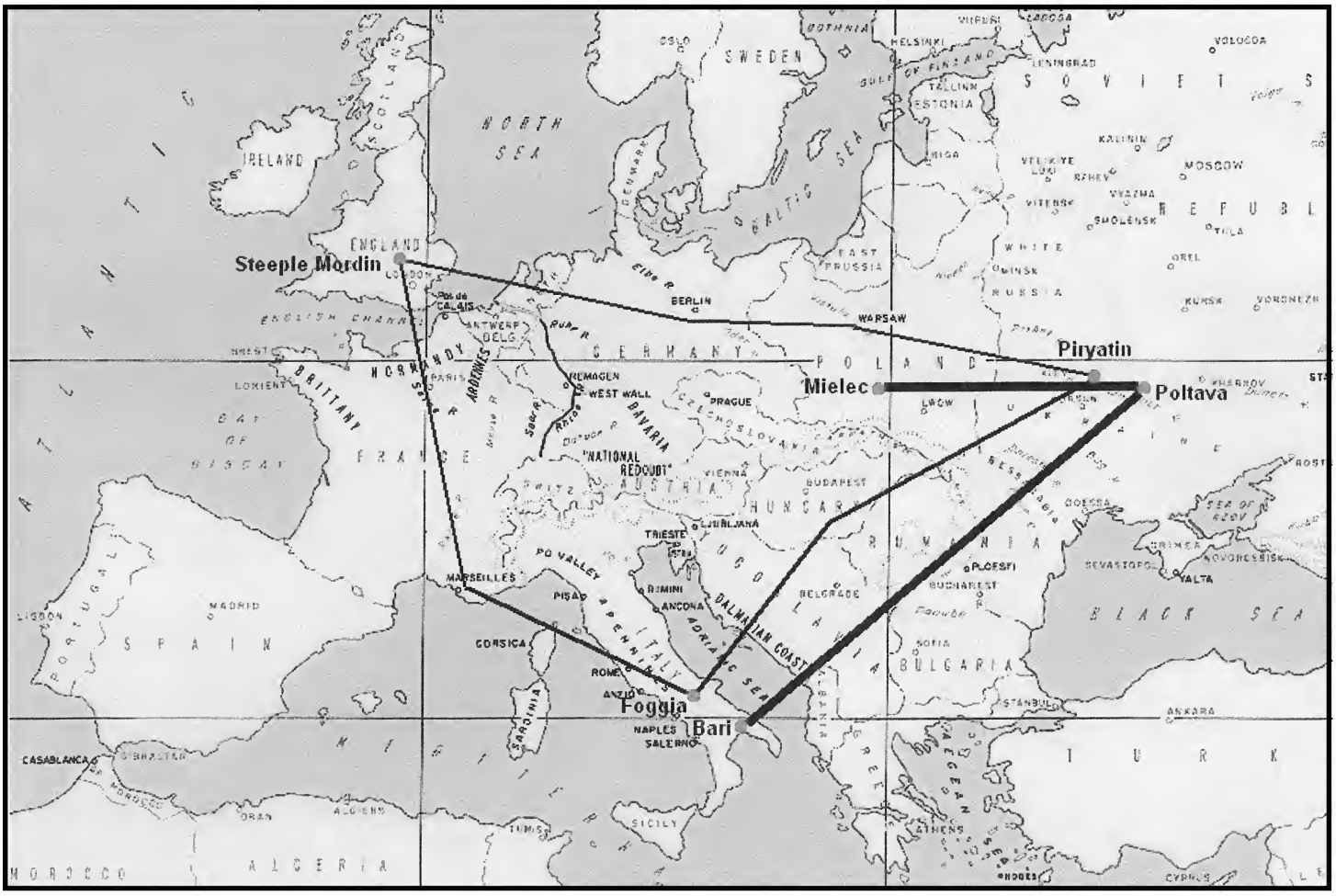
Engineering Manager Bobbie Johnson receiving a commendation from Astronaut James McDivitt, the commander of Apollo 9, for her contribution to the success of the mission, a 10-day earth orbital flight launched on March 3, 1969. This was the first flight of the complete Apollo configuration and the first flight of the Lunar Module. McDivitt, later, was the NASA program manager for Apollo 12, 13, 14, 15 and 16. He retired from the USAF as a Brigadier General and left NASA in 1972 and was a Senior Vice President at Rockwell International.

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION Retirees Bulletin

Fall 2004

Inside: **MERCY MISSION TO WARSAW** by Al White
IT WAS AN EXTRAORDINARY SHARP AND CLEAR DAY by James L. Brooks
AMERICAN AIRMEN MEMORIAL IN POLAND by Ed Rusinek
THE APOLLO EARTH LANDING SYSTEM by Charles H. Lowry



IN 1944, THE USAAF FLEW TWO UNUSUAL LONG RANGE P-51 MISSIONS OVER ENEMY OCCUPIED TERRITORY TO POLAND— ONE, A MISSION OF MERCY; THE OTHER, TO DESTROY CAPTURED AIRCRAFT— BOTH REQUIRED GREAT AIRPLANES AND EVEN GREATER PILOTS.

NORTH AMERICAN AVIATION
Retirees Bulletin

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DEAR NAA RETIREE BULLETIN SUBSCRIBER

In this issue we have two fantastic stories about the North American Aviation P-51 Mustang being used for long distance combat missions over Poland. One involves a mercy mission; escorting B-17s to Warsaw to drop arms for the desperate Polish patriots trying to hold the city until the promised help arrives which never came. The other is a fighter mission to destroy captured American aircraft at a secret German airfield in southern Poland. The P-51 proved to be the outstanding airplane that could fly long distances and to fight whenever required. Perhaps, even more outstanding were the pilots who flew these missions! To fly eight hours sitting in a small cockpit is an achievement. But to fly eight hours under constant combat conditions over enemy held territory is a tremendous accomplishment of human endurance. Thus, our two story tellers, Al White and Jim Brooks, provide us some insights of what it was like. After the war, both pilots joined NAA as test pilots.

In researching background information for the P-51 articles, we discovered a report of an American Airmen Memorial in Poland which was created in a very unique way to honor the final sacrifice of 41,802 USAAF airmen who died over Europe during WWII. In these times when it is fashionable in Europe to howl and growl about America, there still are those who remember what America has done and sacrificed to bring them freedom. Without these sacrifices, the French may have ended up speaking German. Without America defending them in the "Cold War", both the French and the Germans might be learning to speak Russian today. Without compromise, the Poles stood with us during World War II and continue to stand with us in Afghanistan and Iraq.

Most Americans, vaguely familiar with the relationship of America and Poland, usually associate with the contributions made by Thaddeus Kosciuszko and Casimer Pulaski to the American cause during the Revolutionary War. Beyond, few are aware that when Poland regained its independence after World War I, massive hordes of Bolsheviks stormed out of Russia in 1919, intending to impose Communism on the rest of Europe.

The fragile reborn Polish nation stood alone to stem the tide; its fledgling air force, a handful of pilots and a collection of barely flyable crates left over from the Great War. However, a group of veteran American WWI combat pilots—Cooper, Corsi, Noble, Shrewsbury, Crawford, Kelly, Graves, Clark, Fauntleroy, Rorison, Chess, Maitland, Speaks, Murray and Garlick—volunteered to serve in the Polish Air Force and they formed the first Kosciuszko Squadron. It was a very close encounter bound for disaster but, with the Americans, the Poles prevailed. The Poles love America, but they always have a special place in their hearts for American airmen!

In the Summer Issue, we asked Chuck Lowry to favor us with an article about the Apollo Earth Landing System with the three huge parachutes bringing our crews back from space. He has completed the story just before press time and we think that you will all enjoy the results.

A check of the Silent Majority will indicate that we continue to lose many of our old friends and colleagues. We know that it is inevitable but it still hurts. We can only think that God wants some new designs for his angels' wings and he is calling up the very best to design and build them.

NAA RETIREES BULLETIN OFFICE DOWNSIZED TO ZERO

In keeping with the latest effort to become more efficient, Boeing is removing the trailers ensconced around the Seal Beach facility and in the process has deleted the North American Aviation Retirees Bulletin office. We are allowed to use any cubicle available in a transitional area dedicated for visitors and those working on temporary assignments. Fortunately, we still have retained the telephone number and the mailbox so we are still operational. Since we are guests of Boeing, we must accept the hospitality as graciously as it was offered.

WRONG SUBSCRIPTION DATE ON SUMMER ISSUE

Our commercial addressing vendor printed September 2004 over your name and address on the Summer 2004 issue instead of December 2004. It caused a lot of consternation among our readers and a lot of aggravation for us. We did not realize what happened until we received our own copies in the mail. We apologize for the blunder. Many of you sent renewal checks and we credited you for the coming year(s).

NAA/ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Bill Kelley at (714) 637-9374.

The Antelope Valley Retirees Club meets in the South Meeting Room of the Palmdale Culture Center at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell/Boeing retirees are welcome. For information, contact Bill "Tiny" Kisler at (661) 273-0213.

Boeing Valley Retirees Club meets on the 3rd Thursday of each month at the Canoga Park Rec Center, 8500 Fallbrook Avenue, Canoga Park, CA. The president is Jennie Muncaster at (818) 341-8919.

"The Old LAD Stress Group" meets for breakfast approximately every two months at Mimi's Café in Torrance, CA. If you are from the old LAD Stress Group contact Gene Laxton at (310) 378-3113 or Ed Rosenthal at (310) 375-8933.

"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meet at 11:30 AM on the 2nd Wednesday of the month for lunch at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd. and Mariposa Ave.

The NAA 101 Tooling Retirees Group meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at Billy's Restaurant, 5160 190th St., West of Anza Avenue in Torrance, CA.

GPS Breakfast Club meets from 6:00 AM to 8:00 AM every Wednesday at the Primrose Restaurant, corner Seal Beach Blvd. and Westminster Blvd. All are invited. For more information, call Fred Shitara at (714) 750-1016.

Seal Beach Retirees Group meets at 11:30 AM on the 3rd Wednesday of the month at "The Fish Co." on Los Alamitos Blvd. at Katella Avenue. For more information call Marvin Blaski at (714) 848-5717 or e-mail to *mblaski@aol.com*.

The Facilities, Industrial Engineering and Plant Services Retirees Group meets at 11:45 AM on the 2nd Thursday of each month at Buster's (formerly Jolly Roger's) Restaurant in the Long Beach Marina. Contact Joe W. Mausser at (562) 596-5845.

Downey Engineering Group of Retirees known as the "Choir Boys" meets every Thursday for lunch at various restaurants from Downey to Seal Beach. Call Al Risi at (714) 892-5725 for meeting location.

"Ye Olde Pharts Breakfast Club" meets at 10:00 AM on the 4th Thursday each month for breakfast at Polly's Pies at 2025 N. Tustin Avenue in Orange. For information call Don Metzger at (949) 495-5374.

The North American Rockwell Retiree Club of McAlester, OK (a satellite of Tulsa, OK) meets at 10:30 AM on the 3rd Tuesday in March, June, September and December at the Down Town Meeting Place. Call J.A. Darden at (918) 423-0706 for more information.

Tulsa & McAlester Retirees meet for breakfast at 8:00 AM on the 2nd Monday in March, June, September and December at the Ramada Inn, 8181 East Skelly Drive in Tulsa, OK. Call Harry Phillips at (918) 838-3716.

The North American Rockwell Retirees Group of Columbus, OH Engineers and professionals meet at 11:30 AM on the 3rd Thursday of each month at the Berwick Park House. Contact Byron C. Solomides at (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH meets at Noon on the 1st Monday of the month at the Whitehall Community Park on North Hamilton Road in Whitehall. Contact E. Hamilton at (740) 927-5940 for information.

Autonetics Group including Marine Systems, Program Office, Project Office, System Test, Engineers and Designers meets for lunch on the last Wednesday of each month at the HomeTown Buffet, Rose Avenue and Alta Vista Drive in Placentia, CA. Call Mike Vohs at (714) 762-1925 for more details.

Autonetics Industrial Engineering and Maintenance Retirees meet for lunch on the 1st Thursday of each month at the HomeTown Buffet, 390 McKinley, located in front of the Home Depot, in Corona, CA. For more details, call Don Burt at (909) 698-0072.

Autonetics Flight Control Retirees meet at 11:30 AM on the 3rd Thursday of each month except in December at The Lamppost Pizza House located at 17568 Yorba Linda Blvd., corner of Richfield Road, in Yorba Linda, CA. Call Jim Anderson at (714) 779-5620 for details.

Autonetics Retirees meet for lunch at 11:45 AM on the 2nd Wednesday of every month at the Rembrandt Restaurant or the Yorba Linda Country Club. All Autonetics retirees, spouses and friends are invited. Contact Robert Nease at (714) 516-1844 or e-mail to *rfnease@email.msn.com* or Ed Venanzi at (714) 779-5652 or e-mail to *EdVennz@aol.com*.

A Group of NAA Retirees meets for breakfast at 8:15 AM on the 1st Wednesday of each month at Knott's Berry Farm-Chicken Restaurant. All are cordially invited. Contact Maxine Haun at *maxi3131@aol.com*.

Autonetics Financial Luncheon Group meets for lunch at Noon on the last Wednesday of the month at Marie Callendars, 126 East Yorba Linda Boulevard in Placentia. Contact Ken Cantwell at (714) 970-7171 or *Kcantwell@adelphia.net*.

A Group of Engineering Mgt. meets at 11:30 AM on the 3rd Tuesday of the month for lunch at Denny's on Imperial Hwy. and the 57 Fwy. Call Ed Moran at (562) 697-9949 for information.

NAA Tech Reps Assn. (TRA) Breakfast Club meets at 9:00 AM on the 1st Tuesday of each month at the Carlsbad Airport Restaurant. For more information, call El Presidente Rafael Colunga at (760) 940-0525.

Material Group retirees from Downey and Seal Beach meet at 11:30 AM on the 4th Wednesday every month at the Stox Restaurant at Imperial Hwy. and Bellflower Blvd. in Downey. Contact Marian Nielson at (562) 429-1020 or Joan Dominguez at (562) 865-7200 or e-mail to *tatedom@aol.com* for information.

Rockwell Vandenberg AFB Retirees Breakfast Club meets at 8:45 AM on the 2nd Tuesday of each month at the IHOP restaurant in Santa Maria. Contact Marv Bailey at (805) 929-6652 or Al Finley at (805) 937-3690.

ANNUAL EVENT

Bald Eagles 43rd Annual Reunion – will be held on Saturday, April 16, 2005 at the Proud Bird Restaurant. Call Val Yarbrough at (805) 646-2283.

The Hangar Gang – meets at the Proud Bird approximately every 4 months. For time, date and other details, call Gene Salvay at (818) 788-3974 or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

Flight Test Instrumentation Annual Reunion – meets annually at the Fullerton Elks Club. For information, call Frank Vigil at (562) 691-0236.

Tech Rep Association Picnic – A group of retired Field Service Technical Representatives has a yearly picnic in June at a park in Fallbrook, CA. For more information, call TRA President Rafael Colunga at (760) 940-0525 or e-mail to *rafael@nctimes.net*.

The Annual M&P, P.D.L., "Friends Christmas Luncheon" – This group of retirees and employees have assembled in mid-December for a festive luncheon and gabfest for the past 20 years. Those wishing to participate and receive notice of the next December luncheon, call Fred Koeller at (310) 545-8854.

NAA-K B-25 Reunion – will be held on Sunday, August 15, 2004 from 1:00 PM to 5:00 PM at the Wyandotte County Museum in Bonner Springs, KS. For more information, call Harry J. Desko at (913) 287-7223 or write to him at 3024 N. 47th St., Kansas City, KS 66104.

Grants Pass 25th Anniversary Picnic – will be held on Wednesday, September 8, 2004. Contact Bob Morse for details at (541) 474-1438 or e-mail to *lindabob2@earthlink.net*.

NAA Flying Horsemen will hold their reunion on Friday through Sunday, September 17 through 19, 2004 at the Eskaton Lodge in Grass Valley, CA. Contact Harry Shapiro at (714) 993-3496, fax (714) 993-1208 or e-mail *shapsplace@aol.com*.

To have your group or function listed in the CALENDAR OF EVENTS, please send the information to the NAA Retirees Bulletin including identification of the group, date(s) of the event, location including address and name of contact with phone number and e-mail. Send to NAA Retirees Bulletin, 2600 Westminster Blvd., P.O. Box 3644, M/C SJS1, Seal Beach, CA 90740.

A Mercy Mission To Warsaw

by Al White

In the summer and fall of 1944, the 355th Fighter Group, stationed in England and flying P-51 Mustangs, was heavily engaged in combat operations in the European Theater of Operations, flying missions on a daily basis whenever weather permitted.

However, on September 13th no mission was scheduled, and it became obvious that something unusual was being planned. The 4th and 361st Fighter Groups brought over twenty of their Mustangs to our base, and then their pilots were ferried back to their home bases.

We were briefed that evening for a maximum effort mission, code name *"Frantic Seven"*. The 355th FG would depart our base at Steeple Morden, England, early on the morning of the 14th, with four full squadrons (64 airplanes), the 354th, 357th and the 358th plus a bastard squadron made up of the airplanes that were on loan from the 4th and 361st Groups.

The mission was to escort three B-17 bomb groups to drop supplies to the Polish Underground that was surrounded by German troops in the heart of Warsaw, and then take the bombers on to landing in Russia. Due to the length of the mission, fuel consumption was a critical concern. The pilots were briefed to leave their sidearms at home, carry extra spark plugs for the engines, and leave any German fighters alone after one pass. They were also told not to discuss politics, leave the Russian women alone, and avoid any controversy with our Russian "allies."

After all the preparation, the mission was scrubbed on the 14th due to severe weather in the target area. The mission was scrubbed again on the 15th. We departed our base the next morning at 10 AM for rendezvous with the bombers. The 4th FG would escort the first wing of B-17s to the rendezvous point, and the 361st FG would escort the other two wings.

The 355th FG would take over escort at that point for the remainder of the mission. About two hours into the mission, it was recalled because the B-17s couldn't penetrate a thunderstorm wall near Berlin. We were back on the ground at home base at about 3:30 that afternoon.

The Shuttle Mission, *"Frantic Seven"*, was put on hold temporarily, and the group was briefed for an area patrol mission in the Low Countries. Operation *"Market Garden"*, a massive airborne and armor attack, designed to secure a Rhine crossing at Arnhem, required the full resources of the Eighth Air Force to support the effort.

The weather was bad, but we found our assigned area and swept the Brussels-Amsterdam-Ostend area to protect the southwest flank of the invasion. No enemy aircraft were encountered, but the group destroyed several trains.

On the 18th, the 355th FG departed again to take up the mercy mission at the rendezvous point. Our Group Commander, Lt. Col. Stewart was leading the group, but had a generator failure just after crossing the channel. Major Bert Marshall, who was leading the bastard squadron, moved into group lead, and Major Chuck Lenfest took over my squadron, the 354th Squadron. Our route of flight took us across a heavy flak area and several of the Mustangs were damaged. One pilot was hit in the arm by flak, but continued the mission.

Approaching Warsaw, the bombers descended through a cloud layer to about 14,000 feet and were attacked by some Me-109s. Four of the enemy airplanes were shot down by our fighters, but the 358th Squadron lost two planes. Both pilots were listed as KIA. One B-17 was shot down and two more were crippled and escorted to emergency landings in Russia.

The supplies were dropped, but unfortunately due to the drop altitude and the wind, a large portion ultimately ended up in German hands.

Leaving Warsaw, we saw one lone Russian Yak, but he quickly dropped his gear and waggled his wings, so we left him alone.

Our landing base was near a small village, Piryatin, between Kiev and Kharkov. Arriving there my watch showed I had been in the air for eight hours, and I was in the first few to land. Considering the length of the mission and the extra fuel used in the scuffle near Warsaw, the performance of the P-51 was absolutely amazing.

The Russian people proved to be a pretty tough group. The 4th Fighter Group had flown one of these shuttle missions earlier. After their landing, the Luftwaffe strafed and bombed the field. The landing field was a grass area running down a slight slope, through a dry stream bed, and up the slope on the other side. Pierced-planks had been laid out along the actual landing strip.

Earlier, the Germans dropped butterfly bombs, a small anti-personnel weapon that exploded when disturbed. The Russian military ordered the people in the village to sweep the area with long, bamboo-like poles. Fortunately, our group did not face this problem.

Major Marshall fueled up and flew over to Poltava to be briefed for the mission planned for the following day.



Photo from the Al White Collection

Captain Al White, USAAF, 354th Fighter Squadron in his latest P-51D-15, A/C No. 44-14228, named "Mary Lou", escorting B-17s dropping supplies to the patriots in Warsaw and continuing on to Russia.

Several of the Mustangs were left behind, but 56 Mustangs took off the next morning to escort the bombers to a target in Hungary. When we left the bomber stream, we landed in Foggia, on the east coast of Italy.

After a night in Italy, we were briefed on another escort mission on the route home. On September 22nd we departed Foggia at 10 AM and picked up the bombers at Marseilles. We broke contact after the target area and continued back to our base at Steeple Morden, England. All the airplanes were down by 5 PM—another long flight, and another testimony to the capabilities of the Mustang.

To complete our mission, we had flown the first leg to Piryatin approximately 2,250 miles, the second leg to Foggia approximately 1,600 miles and the third leg back to England approximately 1,650 miles. The total distance traveled, not including variations for combat and for "essing" behind the bombers was 5,500 miles.

It was my good fortune to fly nearly every type of airplane that the Los Angeles Division of North American created from the AT-6 to the XB-70 with one glaring exception—the X-15, so I feel qualified to say that the company made great airplanes. Anyone who worked for North American Aviation, in any capacity, should be very proud that he contributed to the design and production of some of the finest airplanes in the world.



Photo from the Al White Collection

A group of American P-51 pilots photographed with their Russian "allies" upon landing at Piryatin. Captain Al White is standing second from the left. 1st Lt. Bob White is standing bare headed. Bob White later was the USAF Project pilot on the X-15 and retired as a Major General.

About the Author: Al White received his Private Pilot License in 1940 after learning to fly in the Civilian Pilot Training Program. He entered the Army Air Corps Aviation Cadet Program and was commissioned a 2nd Lieutenant in May 1942 at Williams Field, Arizona where he served as an advanced instructor for twin engined aircraft. In 1944, he volunteered for combat and was assigned to the 354th Fighter Squadron of the 355th Fighter Group stationed at Steeple Morden in England. His first two combat missions were flown in P-51s on June 6, 1944 on D-Day. Completing two tours with the group, he was credited with one enemy fighter destroyed in the air, two on the ground and numerous ground vehicles destroyed in bombing and strafing missions. He returned to the United States in 1945 and received a BS degree from UC (Berkeley) in 1947. Al returned to active duty in 1948 and completed assignments at Wright-Patterson AFB in Ohio and the Naval Auxiliary Air Base at El Centro in California. In 1951 he was admitted to the USAF Test Pilot School at Edwards AFB and graduated first in his class. Continuing at Edwards, he flight tested the C-119G, F-80, F-86D, F-84F, F-94C and the F-89D. In 1954, Al accepted a position as Engineering Test Pilot with NAA at LAD. He conducted test flights on all NAA aircraft except the X-15 and was appointed Chief Test Pilot in 1961. His greatest recognition came when he flew the XB-70 at Mach 3. His many decorations include the Distinguished Flying Cross, Air Medal with 9 Oak Leaf Clusters, Warsaw Uprising Cross and the Russian Commemorative Medal. In 1960 he was elected president of the Society of Experimental Test Pilots and has received much recognition of his civilian flight test career, including the IVAN C. KINCHELOE AWARD, HARMON INTERNATIONAL TROPHY, OCTAVE CHANUTE AWARD and the USAF AIR MEDAL. In retirement, Al resides with his lovely wife, Betty, in Tuscon, Arizona.

Book Review

THE TIMES OF MY LIFE
A PILOT'S STORY
by AL WHITE

If you read Al White's story of his mission to escort the USAAF rescue bombers to Warsaw in this issue, you know that this is a book that you will not put down. This story is only one of the incredible adventures endured by Al in combat and in flight test. With the holidays coming this is a great book to give as a gift and the cost is very nominal. Give your copy an extra touch and ask Al to sign and dedicate it to you or the person receiving it as a gift!

Price is $20.00 plus $3.00 for Shipping & Handling. Please send requests to:

AL WHITE
14254 N. FAWNBROOKE DRIVE
TUCSON, ARIZONA 85737
(520) 825-6525

SabreJet Classics Magazine

The SabreJet Classics Magazine, a publication of the F-86 Sabre Pilots Association is now available to our readers. The group is composed of USAF Sabre pilots that have served in the Korean War and the magazine contains their personal stories of combat against the MiG-15s over the Yalu River. If you are an F-86 lover, and who isn't, this is the magazine to subscribe to. The cost is $15.00 per year. Send checks to:

F-86 SABRE PILOTS ASSOC.
Larry Davis, Editor
6475 CHESHAM DR NE
CANTON, OHIO 44721

WHAT IS "CHUTZPAH"?

It is when you absolutely refuse to subscribe to the NAA Retirees Bulletin. Then, on your death bed, insist that your children call the bulletin to include a notice of your passing in the "Silent Majority". It happens!

It Was An Extraordinary Sharp And Clear Day

by James L. Brooks

During the summer of 1944, at the height of the air war over Europe, pilots of the 15th Air Force reported seeing what appeared to be American fighter aircraft shadowing the bomber stream during missions deep into Eastern Europe. Concurrently, in the Pentagon, the G-2 section of the Army Air Forces was diligently studying intelligence reports out of Poland of a Luftwaffe base in southwestern Poland, where slightly damaged American fighter aircraft were reportedly seen wearing Luftwaffe colors. In mid-July 1944, the 15th Air Force in Bari, Italy was assigned a top-secret mission. Code name: *Frantic III*.

One of the great battles of history was fought on 27 June 1709, when Peter the Great defeated Charles XII of Sweden at the small Russian town of Poltava. Two hundred and seventy eight years later, on 22 July 1944, an air task force comprised of 58 P-51s of the stylish 31st Fighter Group and 76 P-38s from the veteran 82nd Fighter Group and the 5th Photo Reconnaissance Group streaked across the plains of Poltava over 1,000 miles from their bases in Italy to land at the primitive airfields east of Kiev.

Their mission: to attack a Luftwaffe aircraft manufacturing and repair center at Mielec, Poland and to destroy any captured American aircraft. Flying with the P-51 Mustang group was Brig. General Dean "Doc" Strother, Commander of the 306th Fighter Wing and a central figure in implementing a task that was planned at high levels in the Pentagon.



Photo from the James L. Brooks Collection

Captain James Brooks, USAAF, successfully lead the 307th Fighter Squadron from Italy to Poland on a special long duration mission for which he received the Silver Star.

Landing at Poltava, Strother was met by Major General Permonoff, Area Commander for the Russian Forces, and Major General Bob Walsh, U.S. Attache in Moscow. General Strother briefed General Permonoff on the mission and the primary target laid on the 25th. The Russian quickly replied that such a mission must be cleared through the Soviet Air Defense for the sole purpose of reducing the risk of Yak fighters mistaking our aircraft for the enemy.

General Strother was armed with a message from Major General John Deane, Senior Officer of the Military Mission in Moscow, which stated, "Ignore any Russian objections to the target and inform them after the fact." General Strother, a man of tall and distinguished presence, told the Russian that he was confident that proper arrangements would be made to alert all Russian air units, but regardless, he had his orders; the mission would go as scheduled and that was the last of it.

Intelligence briefings often were treated with a cavalier attitude, but not this one, mainly because of the imponderables and the strangeness of the land. We were made very aware of the following contingencies:

1. Avoid all Russian aircraft. If attacked, engage.
2. Make positive identification before attacking any moving ground targets; battle lines in Eastern Poland fluid.
3. Maps-accuracy wanting.
4. Russian radar stations not reliable.
5. No estimate of enemy aircraft in target area.

The July nights are cool in the Ukraine. Tents and sleeping bags kept the chill to a memory. The gentle mists that hung like a faded curtain over the green meadow where our aircraft waited did not tarry long with the rising sun. **It was an extraordinary sharp and clear day.** It was 25 July 1944, and a maximum effort was on for a low-level mission to Mielec, Poland, over 600 miles west with takeoff at 0900 hours.

At rendezvous, the two groups melded as one, the silver P-38s looking like giant dragonflies cruising at treetop level as the wily Mustangs maintained wary positions a few hundred feet above.

Below, the Ukraine spread like a ruffled blanket to join a limitless mauve of the horizon, occasioned by a brief glimpse of barebacked men and babushka covered women inured to a meager subsistence, gathering crops of corn where a few months earlier tank battles had raged. In contrast, our course took us a scant mile south of the ancient city of Kiev, now mostly in rubble. Where once was a tall building, only a wall stood hauntingly alone, its paneless windows seemingly staring with askance as we roared by.

Some two hours into the mission with the Pripet Marshes behind us, the land took on a more masculine and curious character. Not shown on our maps were World War I trenches, silent and foreboding, stretching like long tentacles to nowhere, a grim reminder of a lost war 25 years earlier.

Now, the target lay ahead, snug among tall evergreens suggesting nothing more than a deserted aerodrome. The P-38s, attacking from the north, missed by minutes a number of juicy targets. For, according to Squadron Leader Hans Rudel

in his book *Stuka Pilot*, Mielec was a temporary base for his Wing, but all three squadrons had just departed for dive bombing mission in the Jaroslaw area some 70 km southeast. There were no captured American aircraft on the field.

After passing slightly east of the target, Major Sam Brown, the 307th Fighter Squadron Commander, breaking radio silence, called for a sweeping left turn away from the frowning Carpathian Mountains towering to the south.

Now, directly below us was a German motorized column of General Model's retreating army being pressed by Marshall Konev's First Ukrainian Front. The two-lane highway was ideally framed and contoured, an excellent escape route for the German Army, but affording little protection from the air. The sixteen Mustangs tore up and ripped the startled convoy, leaving dead and wounded strewn amid the burning vehicles, and including a troop-laden Junkers Ju-52 transport that lumbered hopelessly through my line of sight and six firing .50 caliber machine guns. Fast, becoming concerned with our fuel state, I called for a rendezvous over a truss bridge east of the burning convoy.

After some 15 minutes on course to our base in Russia, at a distance what first appeared to be an advanced flying school traffic pattern right before lunchtime, was a gaggle of Ju-87s dive bombing and strafing the fast advancing Russian Army. I cautioned the squadron of possible Me-109s above us, but they were like weasels in a hen house! The Stuka pilots and rear gunners reacted with stark surprise: some fought savagely, others bailed out. In his book, Hans Rudel states that his squadron escaped the melee, "On sortie over the San River, I ran into a Mustang formation. I am flying with a formation of fifteen bombers twenty-three miles from Jaroslaw, our target for today. I gave the order to jettison our bombs." We overflew Rudel's squadron but did attack Squadrons 2 and 3 of his wing, destroying 27 of the 30 Stukas before our fuel became critical.



Photo from the James L. Brooks Collection

Captain James Brooks in front of his P-51D "February" after returning from the long duration special mission to Poland.

Back at Poltava, the Russians were skeptical of our claims until the battle reports were in from the front. The astonished Russians made no attempt to hide their emotions. General Strother was the man of the hour and the vodka flowed shamelessly! During the celebration, General Permonoff remarked to General Strother that the American pilots looked quite young and Strother replied that the average age was 21.

Arriving back in Italy on 26 July 1944, the group had flown over 3,200 miles and had destroyed over 40 aircraft in the air and an unknown number of enemy ground vehicles and personnel without loss of a single pilot or aircraft. The enormous losses inflicted by only eight Mustangs of the 307th Fighter Squadron with the other eight flying as wingmen covering six o'clock, thrust a new dimension on the Wehrmacht on the Eastern Front. The skies had suddenly become hostile.

Indeed, in his book Rudel stated that the very sighting of the Mustangs caused him for the first time to "jettison his bombs". Rudel flew most of his more than 2,000 tactical missions against the Russians. The fact is that the German Army along with the Luftwaffe, by and large, did not hold the *Stalinsie Sokoly*—Stalin's Hawks—of the Russian Air Force in high esteem. And, unknowingly, they left the door open for the aggressive Mustangs of the 307th Squadron.

It must always remain a matter of speculation what the result would have been had the Russians requested tactical air support from the U.S. Army Air Forces for their advancing armies if for no other reason than to lower the enormous casualty rate. The answer to that question may be hidden in the dark recesses of the Russian military mind.

About the Author: James L. Brooks, a native of Roanoke, VA, entered the USAAF in 1942. Upon graduation, he was sent to Panama where he flew P-39 and P-40 type of aircraft. In 1944, he transferred to the 315th Fighter Group of the 15th Strategic Air Force providing long range escort for heavy bombers from Italy deep into Europe and the Balkans. He ended his ETO tour with 280 combat hours, 13 1/2 kills, and 3 damaged aircraft in the air.

Qualifying for jets in 1946, he served in F-86s with the 4th Fighter Group in Korea and participated on December 22, 1950 in the first all-jet air battle at 42,000 feet over the Yalu River between 12 MiGs and 4 F-86 Sabres.

He joined North American Aviation in 1951 as an engineering test pilot. Over the next six years, he performed test flights in all the F-86 series aircraft, B-45, XF-100 and the F-86 rocket augmentation project.

He was one of the founders and first president of the Fighter Aces Association and is a past president of the Society of Experimental Test Pilots. His war time decorations include the Silver Star, Distinguished Flying Cross with one Oak Leaf Cluster, Air Medal with 20 Oak Leaf Clusters and Unit Citation with one Oak Leaf Cluster. In 2002, he traveled to Moscow to receive a Russian decoration for his action in destroying the Stuka wing attacking the Russians in 1944. Jim currently resides with his lovely wife, Martha, in Mandeville Canyon in Los Angeles, California.

American Airmen Memorial In Poland

by Ed Rusinek

It has been over fifty years since American aircraft flew over a Europe suffering under the Nazi reign of terror. The fierce and bloody aerial battles that raged in the skies above have vanished long ago into the shadows of the past. However, in Poland on the road from Warsaw to Biala Podlaska near the town of Woroniec, one shadow remains. The shadow—the American Airmen Memorial—is a full scale B-17 outline that honors the 41,802 USAAF airmen who died over Europe during WWII.

The memorial was unveiled on Sunday, July 9, 2000. The location is symbolic. It is within a kilometer of a B-17 crash site that is the farthest from any American base in Italy or Britain. It represents the reach of the USAAF offensive and the price the Americans had to pay to destroy the Nazi war machine.

Standing over the shadow outline of the B-17 is a full size replica of the *Flying Fortress* vertical fin bearing the markings of the aircraft that was shot down near the site on June 21, 1944—the B-17G,A/C No. 42-38202 *"BTO in the ETO"*—of the 452nd Bomb Group, 8th Air Force. The bomber was shot down during the first bombing "shuttle" mission from England to Russia.



Cdr. Stanley Golanka, USN, representing the US Embassy in Warsaw, unveils the memorial on Sunday, July 9, 2000, honoring the 41,802 American airmen killed in the liberation of Europe.

The crew of *"BTO in the ETO"* was luckier than the thousands of young men commemorated by the memorial. All ten bailed out of their burning aircraft and while descending on their chutes an intensive race began on the ground to intercept them, between the German army and members of the "Zenon" unit of the Polish Partisan 34th Infantry Regiment, AK (Home Army).

Three of the Americans were captured by the Germans and spent the rest of the war in a POW camp. The other seven were rescued and participated in pitched battles against the Germans as part of the Polish "Zenon" unit for six weeks until they could be transferred to the Russians who secured their return to Britain.

The names of the crew—1st Lt. Louis R. Hernandez, Pilot; 2nd Lt. Thomas J. Madden, Copilot; 2nd Lt. Alfred R. Lea, Navigator; 2nd Lt. Joseph Baker, Bombardier; T/Sgt. Anthony Hutchinson, Engineer: S/Sgt. Herschel Wise, Waist Gunner; S/Sgt. Robert Gilbert, Waist Gunner; T/Sgt. Jack P. White, Radioman (POW); S/Sgt. William Cabaniss, Turret Gunner (POW) and S/Sgt. Arnold G. Shumate, Tail Gunner (POW)—are engraved on one side of the rudder. The other side bears a dedication of gratitude in English and Polish to all of the 41,802 American airmen who gave their lives in the cause of freedom for Europe. It reads as follows:

1942 1945
TO THE MEMORY OF THE FORTY ONE THOUSAND EIGHT HUNDRED AND TWO AIRMEN OF THE UNITED STATES ARMY AIR FORCE, WHO WERE KILLED BRINGING FREEDOM TO THE OCCUPIED EUROPEAN COUNTRIES AND DESTROYING SUCCESSFULLY THE THIRD REICH MILITARY POTENTIAL.

AS TESTIMONY OF GRATITUDE AND THE COMMEMORATION OF THE POLISH PEOPLE

Editor's Footnote: 2nd Lt. Alfred R. Lea was wounded in the leg while participating with the partisan Zenon unit in attacks on the rear of the German Wehrmacht fighting the advancing Red Army. In what must be the most unusual circumstance for a USAAF aviator, he was awarded the Purple Heart medal for his wound received in action as a temporary member of the Polish Partisan 34th Infantry Regiment, AK. Alfred Lea resides in Houston, Texas.

The Warsaw Uprising

By summer 1944, the Red Army had advanced to the banks of the Wisla River across from the Polish capital of Warsaw. The Soviets were encouraging the Polish Home Army (AK) to wrest the city from the relatively small German garrison. The Polish partisans, however, were troubled because as the Soviets "liberated" eastern Poland, they left in their wake a pro-Communist civil authority.

Hoping to establish a non-Communistic post-war government in Poland, the decision was made by the Polish Home Army to attack the Germans in Warsaw in advance of the Red Army with the understanding that Soviet reinforcements would be available if needed. Indeed, the Red Army entered the Warsaw suburb of Praga, across the Wisla River late in July 1944.

On August 1st, the Home Army with a force of forty thousand partisans, joined by the citizens of Warsaw, took control of most of the city. However, the Germans sent reinforcements including S.S. police units, a brigade of Russian ex-prisoners and a brigade of ex-convicts noted for their excessive brutality.

During the sixty-three days of desperate fighting, the Red Army, encamped on the other side of the river, never attempted to provide any assistance. Home Army units, stationed outside the capital, tried to come to the rescue of the fighting city, but they were intercepted by the Soviets, disarmed and interned as prisoners.

When the western allies approached the Soviet command with the request that planes bringing arms to the partisans be permitted to land behind the Soviet lines after the drops, they were met with refusal. A small number of planes, Liberators and Lancasters—flown by Polish, Australian and English crews—suffered horrific losses. Taking off from a base in Italy near Brindisi, they had to fly over enemy territory more than 1,200 miles, wending their way through heavy anti-aircraft fire and German fighter planes and then make the return flight back to Italy. At this time Soviet airfields were located only sixty miles beyond Warsaw.

When the Soviets finally granted the allies permission on September 10th to land in Russia after a relief mission to the partisans, it was too late. The Polish forces in the city had become fragmented and isolated. So, much of the equipment dropped during a massive rescue mission conducted by the USAAF on September 18th fell into German hands. Although the mission proved to be a failure, it did not diminish the nobility, bravery and gallantry of the American airmen participating in this operation.

When hostilities ceased, eighty-five percent of the city was razed and the Polish Home Army was annihilated. The Germans deported the remaining population. On January 17, 1945, when the Red Army entered the city and defeated the German rear guard, there were no forces left to oppose the installation of a Soviet puppet government.

Almost forty years later in 1981, with the Polish Communists removed, the Polish Parliament instituted the Warsaw Uprising Cross medal to be awarded to all military and civilian participants of the Warsaw Uprising and to also be conferred on all foreigners who gave their support. Al White is one of the USAAF participants that was presented this award from a grateful nation.



Marek Abroziewicz, the chairman of the American memorial committee and a member of the "Zenon" Partisan Unit of the 34th Infantry Regiment, AK, addressed the audience after the Polish Air Force band played the American and Polish national anthems and the PAF honor guard fired a salute to the fallen airmen.

The Apollo Earth Landing System

by Charles H. (Chuck) Lowry

"Tremendous","Wonderful","Awesome","Beautiful". These were a few of the superlatives we all heard the returning Apollo Astronauts express as they peeped through a tiny rendezvous window and saw those huge parachutes inflate. At this point in their flight they had watched all the critical systems work right, and they knew the Earth Landing System was the last critical step to coming home. We, the viewing public, also were thrilled when the highly visible orange and white main parachutes appeared to give us a few minutes of descent time before splashdown to contemplate how great it was to get 'em back safely!

The Apollo Earth Landing System (ELS) was made up primarily of the multistage parachute system. It was just one of many primary Apollo Systems, but to parachute people of that day it was the most awesome undertaking one could imagine. We also could not then imagine how much money, time, and effort would be ultimately required to keep up with Command Module (CM) weight growth and other changes.

I was a young parachute engineer working at the NAA Columbus Division in 1961 when JFK announced to the world our goal of "— landing a man on the moon and returning him safely —". Three companies were working on paid Apollo study contracts and NAA was not among them. When the time came to bid on the production contract, it was naturally assumed that one of the big three would get it. We, at the Columbus Division had developed the first operational Retrorocket Landing System for missile recovery, and the Glenn L. Martin Company in Baltimore invited us to join them and propose on an ELS that included means of landing impact attenuation for Apollo. However, when the production contract was awarded, NAA Downey got the big plum.

Since I was the only person in the NAA corporation with the word "Parachutes" on his badge, I was invited to move to California and become the Engineering Supervisor of the ELS Group. When I arrived there were all of 2 people in my group. The parachute contract had been awarded to Radioplane. They were big in drones and associated parachute systems. But most knew Radioplane only as the place where Marilyn Monroe had once worked. Anyway, the Northrop Corporation owned Radioplane and the ELS program was moved to the newly constructed and beautiful Northrop Ventura Division at Rancho Conejo in Ventura County.

At NAA in May 1962, John Paup was the Apollo Program Manager, Charlie Feltz the Chief Engineer, and Norm Ryker was our Assistant Chief Engineer. They and others managed to handle the initial chaos that was called the Apollo CSM program. I soon came to understand why NAA had been awarded the contract—it was our superior management capability—as proven by the X-15 and other great programs.

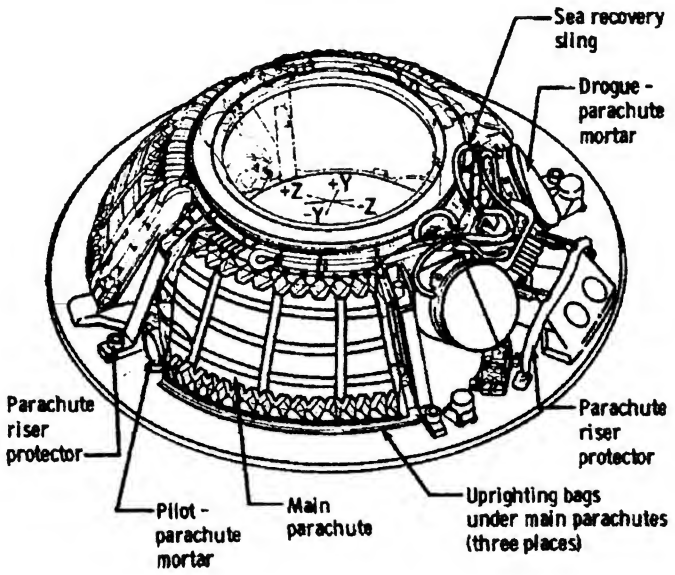
The ELS operational configuration was established early in 1962. As one would suspect, reliability, fail-safe function and redundancy for this important, primary manned system were the buzz words of the day and the features that mattered most. The ELS was not a backup system like an ejection seat or escape capsule; it was the only way home. The system was to incorporate a drogue chute for CM deceleration and stabilization, in preparation for deployment of the main chutes. But to provide the needed redundancy; two 13.7 ft diameter drogues, separately mortar deployed, were incorporated.

The initial design weight of the CM (suspended weight on the parachutes) was 7,800 lb. For such a large weight, a cluster of three 88.1ft diameter Ringsail (similar to the single main chutes used on Mercury and Gemini) main chutes was selected, where any two could provide acceptable touchdown velocities. The 3-chute cluster provided other advantages—3 smaller chutes can be handled and stowed much easier than one huge (say, a single 152 ft) parachute. In addition, testing and logistics were more easily managed with the smaller main chutes. A maximum touchdown velocity of 30 fps with only two main chutes functional was selected to ensure successful impact attenuation.

Three separate mortar-deployed pilot chutes deployed the three main chute canopies. The mortars were aimed to fire roughly normal to the post-entry flight path of the CM and at 90 degrees to each other. This arrangement was established to ensure that no two pilot chutes could be fired into the wake of the descending (and perhaps tumbling) CM and so that none could entangle another. The pilot chutes were 7.2 ft in diameter.

The three main chutes and their pilot chutes were packaged separately and stowed in three quadrants of the CM upper deck. The fourth quadrant contained the two drogue mortars and the structural attach and release mechanisms for all the chutes. The upper deck was then closed out by installation of the forward heat shield.

In a normal entry from space, the forward heat shield was jettisoned at 24,000 ft altitude followed by deployment of two drogues. Then after descent to 10,500 ft, the drogues



Isometric view of upper deck with stowage of parachutes

were separated and the three pilot chute mortars fired. This action deployed the three main chutes which formed the main parachute cluster. Various stages of chute reefing were used in both the drogues and the main chutes to limit opening shock loads and to provide a gradual deceleration of the CM.

But normal entry was easy. It was the abort modes that drove the design of the ELS. Parachute designers don't like unstable or tumbling vehicles. And most parachute failures are caused by attempting to deploy from an unfavorable vehicle attitude—that's when risers get cut on structure and entanglements occur. Apollo abort modes were a nightmare for the parachute designers. Whereas, normal entry consisted of primary heat shield forward travel, low altitude aborts could be other end forward with high rates at ELS initiation. We had a Recovery Dynamics Analysis Group at NAA, with people like Bob Rodier and Dick Thiel who helped define critical system sequencing and set up the tests that would verify the system under all possible flight conditions.

Initially, my job at Downey was to get Northrop Ventura (NV) going with meaningful requirements, and to define CM design interfaces. Much of my time was spent listening to Lou Walkover, of Spacecraft Design, screaming "WHAT'S YOUR STOWAGE CONFIGURATION?" and Jim Schmidt of the Loads Group, demanding "JUST GIMME YOUR LOADS". Lou and Jim had their schedules to meet too, and the approach became "If you can't establish your interfaces right now, we will do it for you and you will be stuck forever with what we give you". Those were heady, but fun days.

But soon NV was building test hardware and we actually ran the first full-scale aerial drop test of a main parachute on July 5, 1962. This was the first of a series of tests to develop the structural grid and to characterize the opening behavior of a single ringsail canopy. In the parachute industry, it is not uncommon to start out with a super-light configuration, drop test it to find areas of high stress, beef it up, and retest, until a final structural configuration has evolved. Since damage occurred on the first 3 tests, and we were the only full-scale tests going, there was much NASA hand wringing. Max Faget, Caldwell Johnson, and many others were on our case, big time. Fortunately, we had Charlie Feltz and Norm Ryker of NAA and John Kiker of NASA to keep things under control, which allowed us to get on with the job.

The initial schedule showed a 13-month program to develop and produce the ELS. It took 6 years!! Most of the added effort was driven by changes in CM configuration and weight. Simply put, we started with a CM recovery weight of 7,800 lb and ended up with 13,500 lb. The original (later called Block 1) CM was made obsolete by the decision to go to a Lunar Rendezvous configuration (Block 2) with a Lunar Module and docking system. This involved many changes to the CM structure, including the upper deck where the ELS was stowed, and the weight went up. Although this decision was made early (July, 1962), Block 1 was to continue toward manned, earth orbital flights.

Following the Spacecraft 012 fire (Apollo 1) many more changes were incorporated in the Block 2 design, which drove the weight up more. By the end, three major ELS programs were instituted to ensure the parachute system could handle the resulting increased loads. So the total ELS program became the Block 1 program, followed by the Block 2 program, followed by the Increased Capability program. The final configuration contained 2 reefed drogues of 16.5 ft diameter, 3 beefed-up pilot chutes of 7.2 ft diameter, and 3 main chutes of 83.5 ft diameter. The allowable final rate of descent on 2 main chutes was increased to 38 fps and couch struts were configured to assure survival even in the worst case of a land landing.

Parachutes do not lend themselves well to rigid analysis as some other types of systems do. So aerial drop testing is generally needed to work out problems and to demonstrate deployment, inflation, stability, and structural adequacy. In the case of Apollo, a huge amount of testing was devoted to system drops under simulated abort conditions wherein the test vehicle was given various adverse attitudes and rotational rates at chute deployment.

But the initial, simple tests were conducted using standard instrumented and ballasted bombs to merely deploy chutes at prescribed velocities. A more complex test vehicle was the specially designed Parachute Test Vehicle (PTV) which looked like a CM from the upper deck up and had a pointed structure below that could spike into the ground at impact for attenuation. The instrumented PTV allowed the testing of chutes packaged as they would be on a CM and it could be ballasted up to the full CM weight. The full-up qualification test vehicle was an Apollo boilerplate which looked very much like a CM but was basically a welded up steel structure.

Boilerplates were also used in Launch Escape System (LES) testing at White Sands and recovered by early versions of the ELS. As an interesting aside, on one particularly bad day in May of 1965, Boilerplate 22 was launched for a high altitude abort test. Very early in the flight, a high roll rate developed, the Little Joe II booster disintegrated, and there was much smoke and fire in the sky. When it all cleared, the vehicle was seen descending on the parachutes for a successful landing, as if nothing had gone wrong. That was our first 15 minutes of fame.

Back to aerial drop testing—most of our drop tests were conducted at the Joint Air Force/Naval Test Facility at El Centro, CA. This facility was equipped with a fully instrumented test range, hanger space, and an all-inclusive shop capability. We had a hangar and a sizable crew, mostly made up of NV personnel. Packing of the large main parachutes alone, was a big operation. Aircraft types involved in the drops included the C-130, C-119, B-66, B-52, and the C-133. The C-133 was bailed from the Air Force and modified by Douglas to accommodate the boilerplate test vehicles.

Altogether, 139 parachute drop tests were conducted to develop and qualify the Block 1, Block 2, and Increased Capability systems. Twenty three drops were of a qualification nature with boilerplate vehicles. In addition, ten unmanned launches from White Sands and KSC, including boilerplates and CMs provided a wealth of ELS experience and verification.

Extensive laboratory test programs were also carried out to develop and qualify component-level hardware such as the mortars, cartridges, reefing line cutters, risers, harnesses, sequencers, etc. Long term testing was also carried out to determine the effects of space exposure on textiles. Wind



Photo from the Charles Lowry Collection

USAF C-133 with CM Boilerplate protruding under the aircraft.

tunnel tests were conducted to investigate parachute inflation characteristics. As the parachutes got stronger and heavier due to increases in CM weight, parachute packing became more and more of an issue. Since no more stowage volume was available, the chutes had to be packed tighter. Hydraulic packing rams were used to increase pack density. The pressure limit to which textiles can be packed is the point at which excessive packing damage occurs. Extensive packing trials were conducted to produce tighter packs with minimum damage. The end result was main chute packs with the density of maple wood.

Perhaps the most challenging problem in the development of the system was the main chute cluster. The ringsail parachute canopy had been used as a single chute on Mercury, Gemini, and other programs. It had proven to be highly efficient with low weight, high drag, good stability, and positive inflation characteristics. But in a cluster, each canopy acted independently. In deployment of the three chutes that made up the cluster, if any one canopy got slightly ahead of the other two, it tended to crowd the laggards and impede their inflation.

In the Apollo ELS, the three pilot chutes were fired in different directions, so the main canopy that became most favorably aligned with the airstream first, dominated. The result, of course, was that the leading chute took most of the load, instead of sharing equally with the others. This would tend to require that each main chute be designed for high loads, resulting in severe penalties to system weight and volume.

Reefing the canopies to limit early inflation and allow the slower chutes to catch up helped, but not enough. After several tests, it was found that providing an open slot around each canopy at the proper location would allow the canopy to inflate only to that slot and hold, allowing the others to catch up. A load sharing ratio of 40-40-20 was finally achieved. In connection with all this activity, it was found that we could remove 4 of the 72 gores for a significant weight and volume savings without significant loss of drag. T.W. Knacke, the inventor of the ribbon type chute (like the ELS drogues), was invaluable in this investigation and resolution.

Another significant problem with the Apollo ELS was deployment from a tumbling vehicle, such as an abort situation. When the vehicle tumbled, risers became damaged or even severed by being pulled over metal corners and edges while under high loads. We lost Boilerplate 3 at El Centro early in the Block 1 testing because of this. Corners were rounded and protection was added, but the final fix was to incorporate steel cable risers and a unique attachment fitting (called the flowerpot) arrangement on Block 2.

But the biggest issue was to accommodate the enormous weight growth of the CM. The original ELS design was to recover a 7,800 lb vehicle. The Block 2 configuration, changes as a result of the Spacecraft 012 fire, and the return of rocks from the moon resulted in a CM weight of 13,000 lb. By the time J-Mission, Skylab and ASTP were over, the design weight became 13,500 lb. This added CM weight did not result from poor design or neglect, rather it was a by-product of expanding mission capability and improving safety, both valuable enhancements to the Apollo Program.

All of this growth was accommodated without drastic ELS concept changes. Added stages of reefing were incorporated and the drogues were made larger to further slow down the CM prior to deployment of the main cluster. Beefing up certain textile components for the higher loads was made tolerable by higher packing densities. In the parachute business, vehicle weight growth always seems to occur, many times with great pain. The Apollo experience has become a touchstone for the industry. The lesson driven home is to allow additional margin for this seemingly inevitable prospect. Vehicle weight growth is, of course, not just a parachute problem; ask the Space Shuttle Orbiter landing gear guys.

In the end, all Apollo flights, including 15 manned ones were successfully recovered. Although most of the ELS (and all the LES) test effort was expended on the abort cases, no aborts occurred. And there were not a lot of white knuckle "close calls" with the system. The most significant incident with the ELS was on Apollo 15 in which one of the 3 inflated main parachutes collapsed shortly before touchdown. The exact cause of the failure could have been immediately determined by examination of the affected chute. However, the frogmen were unable to retrieve two of the three chutes from the ocean and the collapsed chute was lost forever. Extensive investigation suggested three possible causes:

1. A possible collision of the jettisoned forward heat shield with one main parachute. Photographic coverage was partially obscured, but adequate to ascertain it was close.
2. A failure of one or more connector links that attached the risers to the suspension lines. One link (of six) was found to have failed due to stress corrosion on the one chute recovered, but performance was not affected.
3. RCS fuel burning the textile riser or suspension lines. Procedure called for an RCS depletion burn while descending on the main chutes to expend the nitrogen tetroxide oxidizer. This left some residual MMH fuel in the system which could spew out of the nozzle just beneath the affected chute. Tests showed that after the oxidizer was gone, the expelled fuel burned in air and droplets of burning fuel were widely dispersed—enough to reach the textile riser and suspension lines.

The latter was concluded to be the culprit. Recorded history, however, attributes failure to the parachute and ELS system. Others say it was the fault of the RCS. I say it was an "Unplanned Mission Planning Event". It was a painful lesson on how two systems, each working perfectly, could interact and spell big trouble.

We tend to think mostly in terms of hardware and the events connected with them. But in a program of this magnitude there are many human stories. Some very serious, even grave situations, are viewed later as quite funny. Like the time we shipped a set of chutes to KSC for installation on a CM on a very tight schedule and we found a bug had eaten holes in one of the main parachutes. A big investigation ensued, involving bug experts from Florida universities and many briefings, later concluded: (1.) There are no known nylon-eating bugs (2.) Our chutes and packing facilities are not infested with these destructive critters and (3.) This incident was caused by one lone beetle who got trapped in a canopy and was trying to gnaw his way out to avoid a trip into space.

Another incident involved the loss of a very expensive drop test vehicle due to human failure. During a drop test, the C-130 was at altitude and on final approach to the drop zone. A test technician was to approach the PTV at the aft end of the cargo bay, actuate a guarded system arming switch, and then make his way forward just before the drop. There was no aft door on the aircraft and the noise and turbulence were horrific. He wore a parachute, goggles, and was tethered. The tech made the trip aft and actually handled the switch, but it was not actuated to arm the test vehicle. So upon dropping from the aircraft, the PTV augered in—it was totally destroyed along with our test system and instrumentation. Steps were in motion to fire this man who failed to carry out his very important assignment, but cooler heads at NASA reasoned that this man will never, never make this mistake again, which qualifies him above all others for this job. That was a wise and humane decision and no one ever regretted it.

There will never be another Apollo program. But I wish there would be so we could employ the newest materials available today. The Apollo parachutes and other textile components were made almost entirely from Nylon. Today, parachute structural grids are largely made of Kevlar, Zylon, Spectra, and other exotic materials that can easily save 30% on weight and volume. And ringsail designs have been improved to provide higher drag and even better clustering characteristics.

The parachute industry was forever changed by the Apollo ELS experience. Never before, or since, had so many tests been conducted to characterize and optimize parachute canopies, and generally lift the technical data base of parachute design. And many subsequent programs have benefited and continue to benefit from it. And when today's young engineers ask if I really worked on Apollo, I stick out my chest and say "yeahhh"!

About the Author: Chuck joined NAA Columbus Division after obtaining an MS in Mechanical Engineering at the University of Kentucky. Having worked in the parachute industry while in graduate school, he transferred to California in 1962 and became ELS engineering supervisor. In 1975, he went to the Shuttle program as Manager of Mechanical Systems. Later, he was the Chief Program Engineer on the Teal Ruby Experiment in Seal Beach. Chuck retired in 1987 and has served as a consultant on several programs, including the addition of the Space Shuttle Drag Parachute. Presently, he resides in Garden Grove, CA with his charming wife, Bettye.

Contrails From The Past

by Ed Rusinek

Dear Ed,

I enjoyed the Saturn II Chronicles article in the Summer 2004 issue. However, I think Don Binn's reference to Bob Westbrook should have been Bob Westrup, a highly respected Engineering manager on the S-II program.

During the first S-II stage pneumatic test in Station 7, Bob was present, did a few quick calculations and left the building. The test was successfully completed without incident.

Subsequent pneumatic testing of S-II stages, however, was performed in a remote uninhabited area of the Naval Weapons Station.

—Ron Bishop, Fountain Valley, CA

Ed's Resp.: Don confirms that it was Bob Westrup. Good catch, Ron. I worked with Bob in the Navajo Stress Group in the early 1950s, carpooled with him and, even, attended the same church, St. Gregory, in Whittier, CA. Bob was a fine engineer and fine human being.

The Silent Majority

by Stan Guzy

ANSELMO, CHARLES, 79 – died on June 18, 2004 in his sleep at Irvine, CA. Although he retired from the Space Division in Downey, he worked for many years on Saturn testing at Rocketdyne. He is survived by his loving wife, Joanne.

BEERBOWER, VIRGINIA L., 82 – an executive secretary at North American/Rockwell, Virginia died in Laguna Beach, CA of heart disease on May 2, 2004. She is survived by her son Monte.

BRANNON, RAYMOND "RAY", 76 – of Compton, CA died on September 11, 2003. He retired as a toolmaker from LAD with 35 years of service.

BURHOP, HOWARD E., 89 – passed away on July 30, 2004 at his home in Fallbrook, CA. Howard was a project engineer at LAD when he retired in 1972 after 25 years of service. He had been president of the NAA Management Club, member of the Bald Eagles and a certified member of the Mach Busters Club. He is survived by his loving wife Jean.

CANNON, JOHN J., 79 – died of congestive heart failure at home in Tustin, CA on June 4, 2004. John was a project engineer when he retired from Space in 1984 after 33 years of service. His loving wife, Jean, survives him.

CASAGRANDE, JOSEPH P., 88 – passed away June 8, 2004 in Lancaster, CA. Joe started at NAA in 1940 as an assembler/riveter and retired in February 1976 as crew chief. He worked on the Vigilante, XB-70 and the B-1A. He is survived by his loving wife Nita.

CLARKE, PATRICIA H., 80 – died in Redondo Beach, CA on June 9, 2004. She retired from NAA after 30 years of service.

COLEMAN, OMA, 84 – of Aliso Viejo, CA, a secretary at North American Rockwell, died on June 20, 2004 of pneumonia.

COX, MARTIN, 80 – died on February 2, 2004 of cancer in Santa Maria, CA. Martin retired from the B-1 Division in 1986 after 35 years of service. He is survived by his loving wife Olga.

DAVIS, LYMAN E., 75 – died on May 29, 2004 in Tustin, CA after a lengthy illness. Lyman was an engineer on the Minuteman, Peacekeeper, XB-70 and other defense programs. He retired in 1979. Lyman is survived by his loving wife of 55 years, Katherine.

DAY, E. A. "SLIM", 86 – died on July 11, 2004 of leukemia in Union City, GA. Slim retired in 1974 after 31 years of service in Tulsa and LAD. He is survived by his loving wife of 64 years, Audrey

DOYLE, JAMES "JIM", 70 – died on May 20, 2004 in Fountain Valley, CA after a long illness. He worked in reliability engineering on small parts procurement at Downey and Seal Beach.

DWYER, DOROTHY C., 87 – passed away on April 4, 2004 in Rancho Palos Verdes, CA after a long struggle with dementia. Dorothy worked at NAA/Rockwell for 31 years before retiring in 1982.

EZELL, WILLIAM F. "BILL", 74 – died on May 26, 2004 at his home in Palm Desert, CA. In 1950, Bill entered the U.S. Army and served at White Sands, NM where he tested rocket engines. After joining NAA's Rocketdyne Division, he was involved in the development of Saturn and Apollo rockets, the Space Shuttle Orbiter, B-1 bomber, and the Peacekeeper missile programs. He retired from Rocketdyne in 1992 as the Vice President of Engineering and Test. He is survived by his loving wife Katie.

FERRUZZO, MATILDA S., 85 – of Cypress, CA, died on July 4, 2004 of Alzheimer's disease. She retired as a supervisor.

FONG, FRANK – of La Canada, CA, passed away on April 27, 2004 at the Verdugo Hills Hospital in Glendale, CA of a cerebral hemorrhage. He retired from Space Division in 1983 after 31 years of service.

GITTINS, ERIC F., 76 – passed away in March 2004 in Lawndale, CA. He retired in 1984 from LAD Assembly Tooling as a senior toolmaker with 20 years of service.

GONZALES, HORMIDIA "ARMIDA", 82 – passed away at Canyon Crest in Riverside, CA on April 4, 2004. Armida retired after 25 years of service on major space programs as an electronic parts fabricator.

HALEY, GLEN W., 92 – died in Grand Junction, CO on June 29, 2004. After serving in the U.S. Army Air Transport Command, Glen received a master degree and went into writing. He authored three books and ended his working career as a technical writer at North American Rockwell on the Apollo program. He is survived by his loving wife Evelyn.

HARGISS, W. CLARKE, 79 – died in Santa Maria, CA of pneumonia on January 9, 2004. He was a quality control manager at Rocketdyne and served at the corporate office in Pittsburgh before retiring in 1986 after 26 years of service. He is survived by his loving wife of 57 years, Joan.

HAYNIE, ERVIN C., – of Lincoln City, OR, died with his wife Daisy on April 8, 2004. He retired from Palmdale in 1975 after 36 years of service.

HEINLEIN, JOHN H., 74 – passed away on June 19, 2004 at home in Garden Grove, CA after a valiant battle with cancer. John worked in mass properties engineering on the Apollo and Shuttle programs before retiring in 1995. He is survived by his loving wife of 43 years, Dottie.

HORTON, IVY A., 83 – died on May 2, 2004 in Canyon Lake, CA. Ivy worked in Human Resources for 35 years before retiring in 1983. She is survived by her loving husband of 61 years, Bill.

HUDDLESTON, DALE P., 72 – of Cypress, CA, a retired senior engineer, died of lung cancer on May 13, 2004. He is survived by his wife Sharon.

HUSTED, WAYNE D., 80 – died of heart failure on June 27, 2004 at his home in Overgaard, AZ. He had 20 years of service as a liaison engineer and retired from the B-1 Division in 1977. He is survived by his loving wife of 40 years, Beverly.

JELINEK, WALTER A., 88 – died in Lancaster, CA on November 8, 2003. Walt worked for 37 years in engineering flight test at Edwards AFB and at Palmdale. He is survived by his loving wife of 52 years, Erdene.

KING, CLYDE W., 86 – passed away in Lewiston, ID on May 11, 2004. He was in Structures for 50 years, ending on the T-39 Sabreliner. He is survived by his loving wife of 61 years, Barbara.

KREIDEL, SAM, 77 – died of bladder cancer on January 29, 2004 in Cocoa Beach, FL. Sam began his career in Downey in 1948 as a design engineer. He retired in 1992, spending his summers in Montana and winters in Florida. He is survived by his wife, Betty.

LEDONNE, FRED E., 74 – passed away in Taylor, TX on June 9, 2004. Fred joined NAA at the Columbus Division after service in the USAF. He retired in 1993 after 30 years of service including work on space programs at JSC and Downey. Fred is survived by his loving wife Norma.

LEWIS, MARJORIE O., 82 – of Laguna Beach, CA died on July 13, 2004 of cancer. She retired as a machine operator.

McINTOSH, DOUGLAS A., 86 – died at home in Lancaster, CA on July 26, 2004. He started with NAA in 1947 and retired in 1973. He is survived by his loving wife Elsie.

NIEKULA, EDWARD W., 66 – died of cancer on June 23, 2004 in Orange, CA. He worked in component engineering at Autonetics, before joining Northrop. He, subsequently, returned to Autonetics and retired from Boeing. He is survived by his wife Jane.

O'BRIEN, WILLIAM S., 74 – died at his home in Anaheim Hills, CA on May 16, 2004 from Parkinson's disease. Bill joined NAA at the Columbus Division in 1952. In 1959, he was assigned to Vandenberg Air Force Base and, subsequently, to the Downey facility. He retired in 1987 after working on the Apollo and Space Shuttle programs. He is survived by his loving wife Joan.

OLSON, ROBERTA G., 90 – of Orange, CA., died of Alzheimer's disease on August 5, 2004. She was a cost accountant at NAA/RI for many years. She is survived by her loving husband James.

ROBINSON, WOODROW W. "WOODY", 86 – passed away from lung cancer on February 29, 2004 in Philomath, OR. Woody retired in 1977 after more than 20 years in production planning on the B-70 at LAD and Apollo in Downey. He is survived by his loving wife Millie.

RUNNELLS, SR., RICHARD L. "DICK", 75 – joined his wife Elizabeth in death on April 19, 2004 in Lawndale, CA. Dick retired from Rockwell after 48 years of service. He was the scoutmaster for Lawndale Boy Scout Troop 97 from 1964 to 1971.

RUSSELL, MARGARET M., 78 – died on July 25, 2004 during a family reunion at Cape Hatteras, NC after falling down a staircase and striking her head on a tile floor. She joined NAA at Columbus in 1950 in the payroll department. She transferred to LAD in 1960 and obtained a Masters Degree from UCLA. She retired from Space in 1987. Burial was in her hometown at Somerset, OH.

SCHULTZ, GRACE A., 87 – of Hawthorne, CA, passed away on July 6, 2004. Grace retired from LAD Manufacturing, Planning & Requirements Control.

SILVER, DUANE C. "DUKE", 84 – of Antelope Valley, CA, passed away on July 14, 2004 of a stroke. He joined NAA in 1945 and worked on many of the pioneering aviation programs including the X-15, XF-91, XF-93 and lead the powerplant group on the XB-70. He had 29 years of service when he retired in 1974.

SKALICKY, JAMES M., 83 – passed away on November 8, 2003 at Lancaster, CA after a lengthy illness. Jim worked on the AT-6, SNJ, P-51, B-25, F-86, F-100, and F-107. He transferred to flight test/GSE control on the B-70 and B-1 before retiring with 41 years of service.

SMITH, ROBERT, 63 – passed away in Torrance, CA on June 2, 2004. He was an engineer at NAA through the early 1990s.

SWANSON, WARREN E., 83 – passed away peacefully at his home in Playa Del Rey, CA on July 22, 2004. He joined NAA at LAD in 1946 and was involved in the development of the F-100, X-15, XB-70 and the B-1. He was Vice President and General Manager of the XB-70 program and in 1964, President of the Los Angeles Division. Warren retired in 1983 and is survived by his loving wife Peggy.

WEAGE, FRANK C., 79 – passed away at his home in Paso Robles, CA on April 5, 2004 of cancer. Frank retired in 1979 after 26 years of service. Frank was the reliability project engineer on the successful unmanned Apollo 6 mission before returning to LAD. He is survived by his loving wife Wanda.

WHALEN, WILLIAM G., 67 – of Santa Ana, CA passed away on May 14, 2004. Bill retired from LAD in 1994 after more than 28 years of service. He is survived by his loving wife Lynne.

PAX DOMINI SIT SEMPER VOBISCUM



RETIREES BULLETIN OFFICE
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North American Aviation Retirees Bulletin

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NASA Photo

The Apollo 16 Command Module, with Astronauts John Young, Thomas Mattingly II, and Charles Duke aboard, about to splashdown in the Pacific Ocean on April 27, 1972 with a perfect deployment of the cluster of three main chutes and their respective pilot chutes.

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION Retirees Bulletin

Winter 2004

Wishing you a
Holiday Season
filled with
Peace and Joy



Inside:

FROM AMERICAN AIRMAN TO POLISH INFANTRYMAN
by Alfred R. Lea

CRASH LANDING AN F-86D, AN UNFORGETABLE EXPERIENCE
by Ben M. Boykin

THE B-1'S PROUD LEGACY AND PROUD FUTURE
by Scott L. White



As illustrated on the July 1937 cover of POPULAR AVIATION (now FLYING) magazine, the North American Aviation Observation and Reconnaissance O-47 was a robust, tough and solid all metal aircraft. Built to a 1935 U.S. Army Air Corps specification and with the prototype XO-47 first flown in 1935 from a field next to the Dundalk, Maryland factory; the airplane, armed with one fixed .30 caliber machine gun and one flexible gun in the rear cockpit, proved ineffective against faster and better armed enemy aircraft. The few planes stationed in the Philippines at the beginning of World War II were quickly destroyed by Japanese air strikes. Of the 239 built, most were relegated to Air National Guard units and used for training, target towing and anti-submarine patrol.

NORTH AMERICAN AVIATION
Retirees Bulletin

NAAR BULLETIN, an affiliate of the **Bald Eagles, Inc.**, is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

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DEAR NAA RETIREE BULLETIN SUBSCRIBER

With this issue we come to the end of another year. For the young, this is of little consequence. For us in the sunset years of our lives, however, each passing day has its own importance, its own reflection. We watch our family members and our friends slip away into that eternal night and we become more aware of our own vulnerability. This past year has been particularly difficult because we saw so many of our friends and colleagues make that final journey. A few must have died in total isolation because we only learned of their passing by their bulletin being returned and stamped coldly "DECEASED". To all of them we say, "Farewell and may God welcome you with all His Blessings."

This being the holiday season, we have chosen three articles that reflect three different periods of our corporate history. Some of you have complained that we only report about the past, the ancient past! So, we have a report on the B-1B, its current status and its future as reported by the most knowledgeable person, Scott White.

In our last issue, we wrote about the American Airmen Memorial in Poland. Many of you have commented on the article. So we contacted the navigator of the B-17G *BTO in the ETO* that went down and became part of the memorial, Alfred Lea, and asked him to tell us what happened to the crew when they bailed out. He graciously accepted our invitation. It is truly a story of courage, patriotism, sacrifice, dedication, devotion and, even, some humor.

If you are an atheist, the next story should convince you that God looks after us! Ben Boykin was flying an F-86D when his wingman came too close and took off his canopy, helmet and, almost, his head. Much of his story is told by others because he does not remember much of the accident but, surely, God was his copilot on that mission.

We will close this commentary, this season and this year with an old *Irish Blessing*.

May there always be work
For your hands to do,
May your purse always hold
a coin or two.
May the sun always shine
on your windowpane,
May a rainbow be certain
to follow each rain
May the hand of a friend
always be near you
May God fill your heart
with gladness to cheer you.
May God guard you
through each night and day
And ever watch above you.
God smile on everything you do.
God go with you.
God love you!

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IF THE DATE ABOVE YOUR NAME ON THE ADDRESS PAGE IS **DECEMBER 2004,** THIS IS YOUR LAST ISSUE UNLESS YOU RENEW. THERE WILL BE NO FURTHER REMINDER, SO PLEASE MAKE OUT A CHECK TO THE "BALD EAGLES, INC." AND SEND IT IN TO THE ADDRESS ON THE SUBSCRIPTION FORM ON THE LEFT SIDE OF THIS PAGE. IF YOU DON'T RESUBSCRIBE, WE WILL PUT C/S FOR "CHEAPSKATE" AFTER YOUR NAME IF YOU EVER END UP IN THE "SILENT MAJORITY". JUST KIDDING!

NAA/ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Bill Kelley at (714) 637-9374.

The Antelope Valley Retirees Club meets in the South Meeting Room of the Palmdale Culture Center at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell/Boeing retirees are welcome. For information, contact Bill "Tiny" Kisler at (661) 273-0213.

Boeing Valley Retirees Club meets on the 3rd Thursday of each month at the Canoga Park Rec Center, 8500 Fallbrook Avenue, Canoga Park, CA. The president is Jennie Muncaster at (818) 341-8919.

Boeing Valley Retirees Club also meets on the 1st Wednesday of each month at 8:00 AM for breakfast at IHOP restaurant, corner Fallbrook and Vanowen in West Hills. Contact Howard Seese at (818) 344-7861.

"The Old LAD Stress Group" meets for breakfast approximately every two months at Mimi's Café in Torrance, CA. If you are from the old LAD Stress Group contact Gene Laxton at (310) 378-3113 or Ed Rosenthal at (310) 375-8933.

"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meet at 11:30 AM on the 2nd Wednesday of the month for lunch at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd. and Mariposa Ave.

The NAA 101 Tooling Retirees Group meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at Billy's Restaurant, 5160 190th St., West of Anza Avenue in Torrance, CA.

GPS Breakfast Club meets from 6:00 AM to 8:00 AM every Wednesday at the Primrose Restaurant, corner Seal Beach Blvd. and Westminster Blvd. All are invited. For more information, call Fred Shitara at (714) 750-1016.

Seal Beach Retirees Group meets at 11:30 AM on the 3rd Wednesday of the month at "The Fish Co." on Los Alamitos Blvd. at Katella Avenue. For more information call Marvin Blaski at (714) 848-5717 or e-mail to *mblaski@aol.com*.

The Facilities, Industrial Engineering and Plant Services Retirees Group meets at 11:45 AM on the 2nd Thursday of each month at Buster's (formerly Jolly Roger's) Restaurant in the Long Beach Marina. Contact Joe W. Mausser at (562) 596-5845.

"Ye Olde Pharts Breakfast Club" meets at 10:00 AM on the 4th Thursday each month for breakfast at Polly's Pies at 2025 N. Tustin Avenue in Orange. For information call Don Metzger at (949) 495-5374.

The North American Rockwell Retiree Club of McAlester, OK (a satellite of Tulsa, OK) meets at 10:30 AM on the 3rd Tuesday in March, June, September and December at the Down Town Meeting Place. Call J.A. Darden at (918) 423-0706 for more information.

Tulsa & McAlester Retirees meet for breakfast at 8:00 AM on the 2nd Monday in March, June, September and December at the Ramada Inn, 8181 East Skelly Drive in Tulsa, OK. Call Harry Phillips at (918) 838-3716.

The North American Rockwell Retirees Group of Columbus, OH Engineers and professionals meet at 11:30 AM on the 3rd Thursday of each month at the Berwick Park House. Contact Byron C. Solomides at (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH meets at Noon on the 1st Monday of the month at the Whitehall Community Park on North Hamilton Road in Whitehall. Contact E. Hamilton at (740) 927-5940 for information.

Autonetics Group including Marine Systems, Program Office, Project Office, System Test, Engineers and Designers meets for lunch on the last Wednesday of each month at the HomeTown Buffet, Rose Avenue and Alta Vista Drive in Placentia, CA. Call Mike Vohs at (714) 762-1925 for more details.

Autonetics Industrial Engineering and Maintenance Retirees meet for lunch on the 1st Thursday of each month at the HomeTown Buffet, 390 McKinley, located in front of the Home Depot, in Corona, CA. For more details, call Don Burt at (909) 698-0072.

Autonetics Flight Control Retirees meet at 11:30 AM on the 3rd Thursday of each month except in December at The Lamppost Pizza House located at 17568 Yorba Linda Blvd., corner of Richfield Road, in Yorba Linda, CA. Call Jim Anderson at (714) 779-5620 for details.

Autonetics Retirees meet for lunch at 11:45 AM on the 2nd Wednesday of every month at the Rembrandt Restaurant or the Yorba Linda Country Club. All Autonetics retirees, spouses and friends are invited. Contact Robert Nease at (714) 516-1844 or e-mail to *rfnease@email.msn.com* or Ed Venanzi at (714) 779-5652 or e-mail to *EdVennz@aol.com*.

A Group of NAA Retirees meets for breakfast at 8:15 AM on the 1st Wednesday of each month at Knott's Berry Farm-Chicken Restaurant. All are cordially invited. Contact Maxine Haun at *maxi3131@aol.com*.

Autonetics Financial Luncheon Group meets for lunch at Noon on the last Wednesday of the month at Marie Callendars, 126 East Yorba Linda Boulevard in Placentia. Contact Ken Cantwell at (714) 970-7171 or *Kcantwell@adelphia.net*.

A Group of Engineering Mgt. meets at 11:30 AM on the 3rd Tuesday of the month for lunch at Denny's on Imperial Hwy. and the 57 Fwy. Call Ed Moran at (562) 697-9949 for information.

NAA Tech Reps Assn. (TRA) Breakfast Club meets at 9:00 AM on the 1st Tuesday of each month at the Carlsbad Airport Restaurant. For more information, call El Presidente Rafael Colunga at (760) 940-0525.

Material Group retirees from Downey and Seal Beach meet at 11:30 AM on the 4th Wednesday every month at the Stox Restaurant at Imperial Hwy. and Bellflower Blvd. in Downey. Contact Marian Nielson at (562) 429-1020 or Joan Dominguez at (562) 865-7200 or e-mail to *tatedom@aol.com* for information.

Rockwell Vandenberg AFB Retirees Breakfast Club meets at 8:45 AM on the 2nd Tuesday of each month at the IHOP restaurant in Santa Maria. Contact Marv Bailey at (805) 929-6652 or Al Finley at (805) 937-3690.

ANNUAL EVENT

Bald Eagles 43rd Annual Reunion – will be held on Saturday, April 16, 2005 at the Proud Bird Restaurant. Call Val Yarbrough at (805) 646-2283.

The Hangar Gang – meets at the Proud Bird approximately every 4 months. For time, date and other details, call Gene Salvay at (818) 788-3974 or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

Flight Test Instrumentation Annual Reunion – meets annually at the Fullerton Elks Club. For information, call Frank Vigil at (562) 691-0236.

Tech Rep Association Picnic – A group of retired Field Service Technical Representatives has a yearly picnic in June at a park in Fallbrook, CA. For more information, call TRA President Rafael Colunga at (760) 940-0525 or e-mail to *rafael@nctimes.net*.

The Annual M&P, P.D.L., "Friends Christmas Luncheon" – This group of retirees and employees have assembled in mid-December for a festive luncheon and gabfest for the past 20 years. Those wishing to participate and receive notice of the next December luncheon, call Fred Koeller at (310) 545-8854.

NAA-K B-25 Reunion – will be held on Sunday, August 21, 2005 from 1:00 PM to 5:00 PM at the Wyandotte County Museum in Bonner Springs, KS. For more information, call Harry J. Desko at (913) 287-7223 or write to him at 3024 N. 47th St., Kansas City, KS 66104.

Grants Pass 25th Anniversary Picnic – will be held on Wednesday, September 7, 2005. Contact Bob Morse for details at (541) 474-1438 or e-mail to *lindabob2@earthlink.net*.

NAA Flying Horsemen will hold their reunion on Friday through Sunday, September 9 through 11, 2005 at Bob Morse's home in Grass Valley, CA. Contact Bob Morse for details at (541) 474-1438 or e-mail to *lindabob2@earthlink.net*.

To have your group or function listed in the CALENDAR OF EVENTS, please send the information to the NAA Retirees Bulletin including identification of the group, date(s) of the event, location including address and name of contact with phone number and e-mail. Send to NAA Retirees Bulletin, 2600 Westminster Blvd., P.O. Box 3644, M/C SJS1, Seal Beach, CA 90740.

FROM AMERICAN AIRMAN TO POLISH INFANTRYMAN

by Alfred R. Lea

Dedicated to the Polish 34th Infantry Regiment, Armii Krajowej AK (Home Army)

Editor's Note: In the Fall 2004 Issue, we wrote about the American Airmen Memorial in Poland which involved a B-17G that was shot down and crashed in a nearby field. We located the navigator of that ill-fated aircraft, Alfred R. Lea, in Houston, Texas and invited him to tell us what happened to him and the other members of the crew those sixty years ago. He graciously accepted. Here is their story...

On June 21, 1944, our B-17G bomber, *"The BTO in the ETO"* took part in a top secret mission code named *"Frantic II"*. As part of the 452nd Bomb Group, 45th Bombardment Wing we were to join an armada of 2500 planes in the first shuttle bombing raid from 8th Air Forces bases in England to the "Frantic Joe" bases at Poltava, Piryatin and Mirgorod in Russia. The second leg was from Russia to Italy with the third leg from Italy to England—all three hitting continental targets.

As we approached Berlin, a force of 114 B-17 Flying Fortresses and 70 P-51 Mustangs peeled off from the huge formation and headed south to bomb the Ruhland-Elsterwerda synthetic petroleum plants in Lower Silesia. Completing that, we turned eastward toward Russia. The Luftwaffe sent up a Heinkel He.177 Grief bomber to shadow our flight from a safe distance. We flew over Warsaw and the people, realizing that we were the first Allied aircraft over Poland since 1939, broke out in joyful riots to the consternation of the German Gestapo and SS forces.

About 85 miles further east, near Biala Podlaska, we were attacked by the Me.109s. Our plane was in the tail-end Charlie spot of the lower element. The *"BTO"* shuddered under the impact of machine gun and cannon fire coming from 10:00 o'clock low. The German curled under our left wing so close, the folds of his white scarf were discernable. He hit our left inboard engine and the explosion blew out the inboard fuel tank. It hung down like a huge flap. We went into a flat spin with the airspeed approaching redline. The command, "Bail Out, Bail Out" crackling over the intercom accompanied by the blaring klaxon alarm horn told us we weren't going home!



Photo from the Alfred Lea Collection

B-17Gs from the 452nd Bombardment Group over Germany, June 1944

I pulled on the latch for the forward escape hatch as well as the hinge pins emergency release but the door was jammed. I lunged with my full weight and the door fell out and me part way with it. My chest pack chute hung up on the frame. If I let go now, I probably would get entangled in the twin guns of the underside ball turret. The bombardier, Joe Baker, saw my plight and helped me climb back into the plane. A very brief discussion ensued as to who goes first and I dived out, head first.

I tumbled head over heels, delaying my opening of the chute because we have been briefed that the Luftwaffe was shooting men hanging on their chutes. Extending my hands overhead and doubling up my legs stopped the gyrations—the earth was approaching rapidly—it was time to open. I pulled the "D" ring and nothing happened! I glanced down and the pilot chute flaps were still closed. My guess—rotten bungee chords.

With eager hands, I clawed the flaps open and threw out the pilot chute. A tremendous jerk against the tight harness straps signaled the main chute opening. And not a moment too soon either. Upturned faces were becoming distinguishable and the sight of Wehrmacht trucks loaded with riflemen dispensed thoughts that for me the war was over and the rest would be spent in a POW camp. A rough landing momentarily knocked the wind out of me but I was rudely jolted to reality when a Me.109 strafed the clearing where I had landed. Joe Baker landed some 300 yards away and we both rushed to a nearby forest where we buried our chutes.

A nearby ripe grain field offered a vantage point from which to survey the very flat countryside. About a mile northeast was the small hamlet of Swory clustered around a modest church. In the nearby vicinity were three elderly couples reaping the rye with ancient crooked handled scythes.

The question of what to do next suddenly became clear as one of the elderly farmers started walking toward us with the scythe slung over his shoulder. He had a slight limp and looked straight ahead, never indicating that he saw us. As he got closer, it was obvious that the gait was a disguise, that he was nudging a bottle of water for us with his foot. We soon discovered the reason for his caution—a German patrol about a half mile distance. He left the water for us without missing a step.

As soon as the soldiers disappeared, we headed for a farmhouse across the road. As we neared the road, we heard a truck coming around a curve on the road to the west. We ducked in a culvert under the road, just as the truck stopped right above us. We could hear the soldiers talking. Strangely, they did not even look at the culvert and soon drove away toward Swory.

We ran to the farmhouse as soon as the patrol was out of

sight. A friendly elderly man answered our cautious knock. We conversed, using our Escape Kit language translating cards. He fed us rye bread, clabbered milk and raw eggs from his very humble larder. Suddenly, eight men wearing German uniforms appeared from behind his small barn, armed with rifles and pistols. Five deployed as perimeter lookouts watching both Swory and the opposite direction. My anxiety was relieved when I noticed the red and white swallow tailed pennants stitched on their collars—Poland's national colors.

Upon identifying us as Americans, they indicated that we should follow them into the nearby woods. Joe was hesitant until one of them retorted, "Niemcy" (Germans) and pointed at two truckloads of German troops heading our way from Swory.

Their Commandant, clad in Polish Army field gear, was obviously a capable and take-charge officer. He spoke to us very decisively, brandishing his German Schmeisser machine pistol; and, although we didn't understand Polish, we knew the discussion was ended and we best head for the woods to the north.

As we raced towards the woods, we were joined by more combatants hiding in the grain field. Inside the fringe of the outer trees, we discovered a horse-drawn wooden four wheeled cart carrying a heavy German water-cooled machine gun tended by a driver, ammo loader and gunner! A hurried march of half an hour brought us to several log cabins alongside the almost invisible path. Young girls brought us flowers bound with red and white ribbons. We were offered rye bread, milk and water to quench our thirst and a rousing cheer assured us that we were among friends.

We resumed the march and at about 6:00 PM came to a small village where we were reunited with five more members of our crew. We also learned that Bill Cabaniss, Arnold Shumate and Jack White had been captured by the Germans. Bill was severely wounded and someone jumped with Bill to pull his ripcord, and then fell free to open his own chute. We seven felt lucky to be picked up by the Poles.

Pilot Louis Hernandez was last to bailout after trying with all his strength to steady *"BTO"* while the others jumped. When the copilot, Tom Madden, jumped, it became impossible! With a sudden jerking motion, the steering yolk pulled Louis' right arm out of its shoulder socket. He was in very severe pain ever since.

As darkness settled, a civilian arrived. He was a doctor and he walked five miles to help out. He looked about sixty-five. The Germans had confiscated his medical supplies long ago but this did not deter his skills. He gave Louis a shot of vodka and a piece of wood to clench in his teeth. With that, he made him lie down with his head against a tree stump. He put one foot against his ear, the other in his armpit, and with superhuman strength popped the arm back into its socket with a sickening sound!

Around a visually shielded campfire, we learned who our Samaritans were. Serving as our interpreter was a sergeant by the pseudonym of "Dreadnaught". Nobody ever used or let be known their given name in order to protect their family and friends from recrimination and/or physical reprisal. The unit was the 34th Infantry Regiment, Armii Krajowej (AK) Polish Home Army. Its Commandant, code name



Photo from the Alfred Lea Collection

Although attired in a variety of uniforms and armed mostly with captured weapons, the 34th Infantry Regiment, AK proved very formidable, able and willing to confront the Germans in battle. Combat nurse Maria was recognized as a national heroine for her valor in the service of her country.

"Zenon", led about 200 men at the time of which 20 were splendid cavalry troopers with unbelievably well trained mounts. Additionally, an invaluable asset, were three women combat nurses serving full time.

When they rescued Hernandez, the women carefully retrieved his parachute and Mae West. We later discovered that they meticulously went over all these items, cutting yards of silk from which to make clothing and other necessities. They even unraveled the seam stitching to recover the thread for surgical sutures. Medical supplies were scarce, but their ingenuity was a constant source of amazement.

That first night in the village, we witnessed a steady drone of Luftwaffe twin-engine bombers heading west to Poltava. They numbered at least 200 planes; we stopped counting and started to pray that our forces had been alerted. Months later, we learned that this was the most devastating loss suffered by the USAAF...night fighters and anti-aircraft artillery promised by the Russians were non-existent AND they refused to allow USAAF fighters to rise in self-defense. Illuminating the field with flares, the Germans found our planes aligned in rows and proceeded to destroy 44 of the 72 Flying Fortresses, damaging 26 others, and to destroy 15 P-51 escorts. Adding further insult to injury, 450,000 gallons of fuel were also ignited.

The Polish civilian hospitals found wartime shortages a huge obstacle in providing basic care for the populace. They did, however, provide many clandestine treatments to the more seriously wounded AK troops using the subterfuge that they were farmers.

It was at this time that we learned of the death of P-51 pilot Lt. Frank Sibbett of the 4th Fighter Wing. He was shot down trying to prevent Me.109s from strafing our men in their chutes. For three days, the staff at the hospital in Miedzyrzecz tried valiantly to save his life but he died from his burns and wounds. In defiance of the German occupiers, he was buried in the local cemetery with full military

honors. His grave was marked with a carved wooden cross bearing a four bladed propeller.

Except for the rifles and pistols salvaged from the 1939 attack by the Germans and Russians, most AK military equipment was "requisitioned" from German and/or Russian sources or was dropped or flown in at night on clandestine grass airstrips by RAF and Polish pilots flying Douglas C-47 *Dakotas* or Westland STOL *Lysanders*. Contact was maintained with the Polish Government in Exile in London by a radio transmitter provided by the RAF complete with operator. A generator mounted on a bicycle whose chain drive provided electricity powered the set or transportation as required. Messages were coded and brief as practical to avoid detection and location by German range and direction finders.

The news of our recovery by the 34th Infantry Regiment AK was sent to London, complete with our names, ranks and serial numbers within 24 hours of our unplanned arrival on Polish soil.

The AK Headquarters conducted the war at every level. Money problems were alleviated by possessing the occupation General Government currency printing plates, paper and inks. Identification papers were at hand, with stockpiles of stolen German Kennkarte ID forms supported by legal stamps and seals.

On June 30th, we experienced our first fire fight. That night we stopped at a small farm house and had just started to eat when a cyclist/sentry alerted us that Gestapo agents and a detachment of Mongols—apparently recruited during their Caucasian drive—were approaching the area. We made it to the nearest rye field when the Gestapo opened fire on us. Zenon jumped up with his machine gun, a German Spandau, and fired several quick volleys. Four Germans were killed outright and a fifth tumbled down. The rest beat a hasty retreat.

The respite gave us a chance to move into the nearby forest where the rest of the force of 200 men was assembled. The Germans returned—about 500 of them—-with light field guns and a tank. The battle lasted for five hours before the Germans retreated, leaving 48 dead and many more wounded.

A few days later, thirty of us including all seven Americans moved out on a day's march to a sizeable farm on a hill overlooking a Luftwaffe base in the valley below. We reconnoitered the area as we watched Junkers Ju.88 twin engine bombers come and go long into the night. The next morning, a Polish Air Force major arrived. He couldn't speak English but he had an armful of operation and tech manuals for the Junkers Ju.88. Through Dreadnaught, he explained that some Polish civilians had access to the field and with their help, they had enough forces to capture the field at night and hold it until we stole two planes and flew them to England.

The manuals were very adequate and I mentally prepared charts to fly via Gdynia, the Baltic Sea, across Denmark and on to England. However, the more we thought about it, we realized that the Poles would take tremendous losses in lives to free seven Americans and the plan was dropped.

Usually, we Americans were spread out amongst the regimental units. Due to the shortage of weapons, we were assigned basic labor tasks in support of the troops. This scattering assured less attention to our presence. The heat was on the Germans to capture us dead or alive! A cash award had been posted and the Axis radio portrayed us as bandits and rapists.

In spite of all this, there were moments of levity. When the cavalrymen learned that Hernandez was from El Paso, Texas, they dubbed him "Cowboy" and offered him a horse to ride. With his sore arm, he volunteered me in his place. That was a big mistake—riding bareback clad only in my GI undershorts with only a loose rope bridle. The horse didn't understand English commands and soon stripped me from his back by use of some thorny plum tree branches. For all my daring, I was assigned to a single-horse drawn four wheeled wooden farm cart to haul around ammo and weapons. At other times, I served as an extra pair of eyes and ears for a sniper/guard.

The AK used a methodical protection system involving encircling bands of lookouts and sentinels around their perimeters at all times. Outermost, were inconspicuous men posing as civilian bicyclists. To their rear were other bicyclists and/or cavalrymen; all relaying signals or carrying messages quickly to Zenon and his adjutant, continually updating German whereabouts and strength. Attack, ambush or withdrawal plans were constantly updated.

The favored means of getting supplies was to attack German truck convoys. The method was to select an ambush site with a forest on one side and a rye field on the other side. When the convoy came down the road, the Poles would openly attack from the forest, disabling the lead truck and the last truck. The Germans would immediately take cover in the rye field and be caught in a crossfire. Disposing of the enemy, the Poles would remove the supplies, weapons and ammo, set the trucks on fire and disappear into the forest. At times, prisoners would be taken in these actions. Prisoners that were regular army usually would be released that evening. However, if they were Gestapo or Secret Police, they would be executed since they were involved in the brutal killing of innocent civilians.

German reprisals for civilians aiding the AK and the Yanks were swift and brutal. We were helped by several elderly couples and their grandchildren wards. Soon after our departure, the Germans arrived, locked them in their houses and burned them alive as the German troops stood off efforts of the neighbors to rescue them. This is what they called "Culture Europa".

A new clay-like plastic explosive, complete with instructions, had been brought in by the RAF. After conducting a very convincing test, it was decided to be used on a mixed freight/passenger train scheduled to pass within the vicinity the next day. A team was selected for the operation and I felt lucky to be a part of it. I had lost my outer boots when I bailed out from the B-17 and the thin shoes which I landed with had worn out miles ago. It took several weeks to "requisition" German boots that would fit me. My bare feet had gotten as tough as shoe leather so that was how I went on the raid.

Departure was under cover of darkness, allowing arrival at daybreak to secure the ambush site and to watch for the railway guards known to investigate the right-of-way ahead

of the train. They were thorough, checking both rails and ties. As they disappeared down the track and out of sight, we hurried from our hiding place and securely packed the plastic against the rail webs—nicely concealed from above by the rail head. An ear to the rail (just like in the Western cowboy movies) told us that our prey was approaching. We rushed back to the edge of the woods and waited.

Here it comes with three German riflemen perched on the European style front bolster. Two snipers take careful aim and fire simultaneously. In a blinding flash, the rails are blown from under the steam locomotive, sending engine and cars flying in all directions. Instantly, the squad retreats down a narrow footpath leading into the forest—running as fast as we can—this derailment will bring Germans from every direction.

However, the huge forest will hide our movement for many hours. At about 11:00 PM we reach a gravel road skirting the trees. Quietly, we hurry, grateful for the darkness.

The scout ahead signals a halt. We group cautiously and look at a dimly lit house of a large dairy farm. The farmyard is empty and the barn shrouded in silent darkness. Gutteral Germanic voices and laughter belies the Wehrmacht guards that are playing cards inside and are unaware of our presence.

Our assistant cook is in the raiding party. He calls a meeting—men are posted to cover the house, some to watch the road in both directions. Two men, armed with machine pistols, head for the barn, enter cautiously and come out leading a milk cow. Miraculously, the cow remains silent. How lucky can we get?

The cow was lead into a small woods and carefully butchered. The men shouldered the cuts of meat and we continued to hurry along the road. We finally entered the forest again and fall asleep. We have run and/or marched nearly 45 miles in some 14 hours. The score: 1 train, 1 cow, no man lost and me with two very sore feet.

The next morning we were rudely awakened and told to clean our uniforms, weapons and to wash up and shave on the double. One of the combatants came up with some soap and water and gave us a shave and clipped our hair a little. Hernandez asked, "What's going on?" They said, "Don't you know? It's the Fourth of July! This is American Independence Day!" So here in this little village of ten or twelve houses with Gestapo Headquarters only a few miles away, we celebrated with a parade as the 34th Infantry Regiment, AK passed in review, their weapons gleaming, followed by the local fire brigade with their glistening brass helmets.

The Chaplain held a Mass and a blessing. Zenon made a speech, reflecting on our common desire for freedom and the celebration began. Vodka and a keg of requisitioned German beer was shared among rousing cheers, salutes and toasts. The festivities halted abruptly when lookouts advised that a Gestapo Opel sedan was approaching under protection of a white flag.

Zenon, the picture of military poise and protocol, approached the car, coolly appraising the occupants. The Gestapo leader, a Colonel Mueller, told him that they would give cash awards and pardons to the 34th Regiment if they would work with the Germans. Obviously, they were not aware of our presence. Zenon, totally enraged, slapped him across the face and ordered their staff car burned. The three occupants were forced to walk back. Well, since we were only a segment of the regiment, we had to disappear back into the forest fast.

During the next nine days, the unit traveled west to the Russian lines. Everyday, we could see German planes fly overhead. Many of these flew quite low. The Germans were flying Junkers Ju.52s with red crosses painted on the sides. The Poles called them "Meat Wagons" because they would bring back the wounded from the Russian Front. However, it was a well known fact that they carried fresh troops and supplies to the front.

The Poles developed an effective tactic to combat these low-flying planes. The transports were referred to as the "Morning Express" since they normally operated just after dawn. Within the unit were several Polish cavalrymen with the most beautifully trained horses I have ever seen. The



Photo from the Alfred Lea Collection

A Catholic field Mass held with the 34th Infantry Regiment, AK and local firemen in German occupied territory with an 8th Air Force parachute draped over the altar to celebrate the American Independence Day on July 4, 1944.



Photo from the Alfred Lea Collection

Horse drawn heavy machine gun units of the 34th Infantry Regiment, AK drawn up for an ambush on the edge of a forest.

horsemen would ride out and hide in hedgerows or under trees. As the planes came overhead, they would ride out and riddle the underside of the cockpit with machine pistols. In the forty days we spent with them, we witnessed them shoot down four planes.

On July 14th, the Russians captured the Polish city of Wilno and the Poles increased their attacks on the retreating Germans. While fighting in what was our final battle together, I sustained an injury which later earned me a Purple Heart. It wasn't very heroic, really. I was assigned to drive an ammunition wagon which consisted of an old four wheel, horse-drawn farm wagon with one horse. At the outbreak, we started to head into a swamp that was part of the Pripet Marshes. On our way in, we ran into a retreating group of Germans. Their point troops assumed that we were Russians and, in the ensuing fracas, we had to retreat over some broken terrain. With machine gun fire over my head, I jumped off and started to run alongside the wagon. Somewhere, I stumbled, fell under the horse and he stepped on my leg and fractured it. Luckily, it was just a hairline fracture, but it started to swell up like a balloon. I thought it was just badly bruised so I didn't stop running.

The German force of about 3,000, thinking we were a major Russian unit started to relentlessly force us into a shrinking perimeter. Some of the combatants told us that they would never allow the Germans to take us alive! Suddenly, we heard a lot of artillery and a ring of explosions all around us. The Germans pulled out and left us.

On the afternoon of July 27th, after many days of unbelievable events with retreating Germans and advancing Russians, the 34th Infantry Regiment,AK met the Russians. Their colonel came to see us and was taken aback when Zenon introduced us in flawless Russian. He agreed to notify his headquarters and expedite our return to England. The next day a Soviet major escorted us, Zenon, Dreadnaught and an aide from Polish AK Headquarters to his headquarters several miles away.

The transaction that took place was totally odd! Zenon, fully aware of Soviet treachery, insisted that they fill out and sign seven individual receipts in triplicate, complete with name, rank, serial number and a statement of our good health. The original went to AK Headquarters in Warsaw, a copy to the 34th Regimental District and one for the Russians.

On July 30th, we had to say farewell to the Poles. How do you tell someone that you owe them so very much? We couldn't. We finally just shook hands, saluted and left.

We were driven to a recently seized Luftwaffe air strip and from there we were flown in a Russian built C-47 to Poltava. When we were unceremoniously dumped off from the taxiing airplane at the USAAF base, the GIs in the Operations tent stared in disbelief at these seven men clad in various AAF issue, civilian clothing and combinations thereof.

All procedures to identify us were momentarily interrupted by crackling on the Ops radio. A Lightening P-38 pilot coming in from Italy was requesting a straight-in landing. His wingman was shot down over occupied territory. He landed, picked him up and had him sitting in his lap! It turned out that the pilot was a classmate of our copilot, Tom Madden.

Within a few days, we were returned to our base at Deophen Green in England. The debriefing with Allied Intelligence took over six hours. Our detailed account of our experiences from bailing out of a crippled B-17 on June 21, 1944 until we returned to Poltava on July 30, 1944 was beyond parallel in the European Theater. We concluded the narrative of our report with the following statement, "If we worked the rest of our lives for the Poles, regardless of the dangers and hazards involved, we should never be able to repay what they did for us."

About the Author: Alfred Lea first applied as an Aviation Cadet in 1939. However, his employment at various defense facilities as an architect, pattern maker, and mold loft manager resulted in priority deferments. In March 1943 he was called up to active duty in San Antonio, Texas. Three decades later he joined the Confederate Air Force as a navigator for the B-17 named the "Texas Raiders". On his first ride, it wasn't until he landed that, ironically, he realized the date was June 21, 1974, the 30th anniversary of his being shot down over Poland. Al resides with his charming wife, Dot, in Houston, Texas.



Photo from the Alfred Lea Collection

Navigator Alfred Lea, Flight Engineer Anthony Hutchinson and Pilot Louis Hernandez after returning to base in England in August 1944.

PLANES OF FAME IN CHINO NEEDS VOLUNTEERS

The Air Museum in Chino, California needs volunteers to help restore a North American Aviation O-47, the first all metal airplane. Although much of the airplane is still restorable, it was recovered from a lake and the right wing was badly demolished. The project requires volunteers with all sorts of skills and/or interest! Are you still young enough to enjoy standing next to an airplane? Come on out Saturday! Any Saturday! Everyone is welcome!

The *PLANES OF FAME* museum has over 100 aircraft on display, dominated by North American Aviation designs, with 75 in flyable condition. Not sure if you want to participate? Come out anyway and meet some real aviation buffs. For more information, call (909) 597-3722.

Crash Landing An F-86D, An Unforgetable Experience

by Ben M. Boykin

After graduating from the New Mexico State University in Las Cruces, NM on January 31, 1953 with a BSEE and a commission in the United States Air Force (USAF), I accepted employment with Westinghouse in Ft. Wayne, Indiana. That same week, I also received orders to report for pilot training duty in San Antonio, on February 11, 1953. My processing in San Antonio sent me on to Kinston Air Force Base, Kinston, NC, for primary where I got 25 hours in a PA-18 Piper Cub and 120 hours in a North American T-6G. I then went to Webb AFB in Big Springs, TX, for basic training where I got 57 hours in a North American T-28 and 70:30 hours in a Lockheed T-33. I received my USAF wings February 25, 1954, and was selected to go to Nellis AFB, Las Vegas, NV, for advanced training in the North American F-86F daytime fighter aircraft (hard wing leading edge). There, I received 62:50 hours and qualified for Air to Air Combat in the F-86. My flight instructor was Captain Jim Kasler, a Korean War Ace with six MiGs to his credit. Kasler later spent several years as a POW in Vietnam. Upon his release, he retired a full Colonel. He had tremendous influence on my learning daytime fighter tactics.

I was assigned to the 41st Fighter Interceptor Squadron (FIS) at Johnson Air Base (AB), Japan, in July 1954, which was one of three squadron's in the 35th Fighter Wing that backed up the F-86 combat squadrons in Korea. Two weeks after arriving at Johnson AB, all three squadrons, the 39th, 40th and 41st, were relocated to Yokota AB, a few miles away, both being about 30 miles from downtown Tokyo.

The 41st FIS pulled alert missions 24/7 at Yokota AB with a detachment located at Niigata AB outside of Niigata, Japan, on the north side of the main Japanese island of Honshu on the coast of the Sea of Japan. At the time, the 41st FIS was equipped with the F-86E (slats on the wing leading edge) Sabre jets. In January 1955, we transitioned to the F-86D, the first all weather single-seat fighter interceptor.

On August 27, 1955, a flight of four F-86Ds was dispatched to Niigata AB, Japan, for two weeks of alert duty. The routine required two pilots on alert 24/7 while the other two could plan, brief and fly training missions.

Lt. Donald "Dad" Horn and I got permission to plan, brief and fly a training mission that would entail one pilot filming the other doing acrobatics with his airplane in autopilot controlled mode. On August 29, 1955, Horn and I had just completed our training mission briefing and were headed out to our aircraft when the alert crew got an alert call of an intruder penetrating our line of defense. The alert crew told us to go ahead and take the intercept and identification since we were about to take off anyway.

Horn and I were airborne and 2 minutes 29 seconds later being vectored by Ground Control Intercept (GCI) toward an unknown bogie. We made the intercept and identified it as a North American B-25 "Planned Intruder" testing our alert awareness and reactions. Following several hi-lo and radar controlled intercepts, we reported the intercept and were given permission to proceed with our previously planned mission.

I stabilized at 23,000 feet, 300 knots, and went to autopilot. Horn executed various acrobatic maneuvers while I photographed him with a Revere 8mm, three lens, magazine load movie camera. We finished one magazine and were nearing the end of the second magazine when I called for Horn to rejoin on my left wing while I photographed him through the telephoto lens.

The last thing I recall was seeing Horn slowly coming on my left wing until all I could see in the telephoto viewfinder was his helmeted head in the cockpit.

From this point on, I will tell the rest of this story as Horn related to me afterwards and as the Safety and Flight Evaluation boards concluded some months later, as well as many, many pilots having expressed their own personal opinions of the sequence of events, surmising what happened.

Horn had proceeded to join up on my left wing. As he began to slow his approach and ease up into position, he said his right wing began to dip down and as he overshot a bit, he pulled the stick back and to the left trying to break away, but instead, went up and over my aircraft to the right, dragging his right wing tip through my canopy. He said my canopy appeared to explode in thousands of little pieces of glass and then he lost sight of me.

When Horn regained visual contact, he said I appeared to still be under autopilot control, at 23,000 feet but only at 230 knots and headed over the coastline and out over the Sea of Japan. He closed in and saw that the canopy was gone. My helmet was also gone but every few minutes my head would duck down into the cockpit and then I would look out and do a 360 degree look-around, like fighter pilots are supposed to do keeping their "head on a swivel".

Horn said I appeared to spot him visually, aft and to the rear on the right side about the 5:00 o'clock position and that I gave him the OK high sign, first finger and thumb. Horn moved closer and gave me hand signals to turn left back toward the base and descend as I was obviously not on oxygen at 23,000 feet. He stated that my head continued to bob up and down into the cockpit every minute or so but that I did start a coordinated left turn and was descending. He said I again gave him the OK high sign.

Horn then overshot my position as I must have throttled back and he again lost visual contact and never did pick me up again in flight before he saw an F-86D on the beach below.

Here again, from this point on, the sequence of events is as conjectured by the "experts", including myself.

I apparently suffered acute anoxia, due to lack of oxygen, where my memory was the first thing to go. My subconscious apparently took over with the prior training of emergency procedures well entrenched therein and I executed a 360 degree flame out emergency landing procedure. My head bobbing down into the cockpit periodically was probably using the oxygen quick disconnect to obtain oxygen in the absence of my helmet.

Next, I apparently saw this long stretch of beach about 30-miles north of Niigata and set up a 360 degree overhead



Photo from the Ben Boykin Collection

The badly battered right side of the F-86D-55, A/C No. AF52-9991, with a sea anchor still embedded in sheared wing.

emergency landing procedure. The Operations Officer from Niigata AB, said I evidently approached the beach, made initial contact with the 120 gallon drop tanks that I had not jettisoned, leaving marks in the sand, became airborne again and then settled on the drop tanks.

From there, with the right wing and the fuselage I demolished five old derelict Japanese fishing boats which had been pulled up on the beach, shearing off most of the right wing and picking up a sea anchor in the right flap that spun the aircraft around, up on its nose, finally coming to rest headed in the opposite direction from the initial landing. The rocket pod had become detached, strewing the 2.75 HVAR rockets around like firewood.

The first recollection I had since Horn's joining up sequence, prior to the mid-air collision, was laying on the beach about 40-yards from the aircraft, with my back and head against my parachute, and hearing the gear unsafe horn blaring out and seeing Japanese children running up and down the fuselage and carrying the 2.75 HVAR rockets around.

I was aware of people around me but could not see them. My vision was "gun barrel" vision and I could only see directly in front of me until oxygen began to get back into my system. I later found out that a local Japanese civilian had secured a bandana around my head over my left eye brow where I had taken a pretty nasty hit from either the helmet oxygen disconnect when it went out on the rapid decompression due to the canopy loss, or from the 8MM movie camera I had against my left eye photographing Horn's approach.

I recall hearing a helicopter very close and then what turned out to be a Marine in the Rescue Squadron at Niigata, saying, "Relax lieutenant, we'll have you out of here and back to base in no time".

Besides the loss of oxygen and my memory, I suffered a slight concussion, required seven stitches through the left eyebrow, performed excellently by the base dentist since no MD was available, two very black eyes and a broken nose which was repaired after the swelling went down.

"Dad" Horn and I had to meet with a Safety Advisory Board and a Flight Evaluation Board following the accident and both of us were back on flight status sixty days later.

It was theorized that my airspeed had slowly decreased from 300 knots to 230 knots while still at 23,000 feet. When Horn tried to join up and overshot, his right wing got caught in my left wing "wash" and due to the slower speed, lost its lift while the elevator still made his aircraft climb with his right wing "stalled", contacting my canopy on the pass over.

I considered putting in for Japanese Fishing Boat Ace recognition, but decided that probably wouldn't be very prudent. My dad in Deming, NM, heard about the accident on the Silver City, NM radio, name and all, and when he got home he told my mother, "Well, the Good Lord must have something else in store for your son Ben".

To this day, I still have absolutely no recollection of the mid-air collision, the post collision events or the landing and my nose still doesn't look very straight.

About the author: Ben completed his active duty with the USAF in 1957 with over 1,000 flight hours in the F-86E, F, and D and the F-94C. In 1957, he joined the North American Aviation/Rockwell International Space Division where he held key assignments on the Navaho, Hound Dog, Apollo, Skylab, Apollo/Soyuz, Space Shuttle, and STSOC in Downey and at Houston. Ben retired from the USAF Reserve in 1982 after 28 years of service. In 1994, he joined AlliedSignal as Program Manager at NASA White Sands Test Facility in New Mexico. He is retired now and resides with his charming wife in Las Cruces, NM.



Photo from the Ben Boykin Collection

Shattered remnants of one of the five beached Japanese fishing boats destroyed in the forced landing, making Ben first "Five Fishing Boat Ace".

Bald Eagles 43rd Annual Luncheon

April 16, 2005

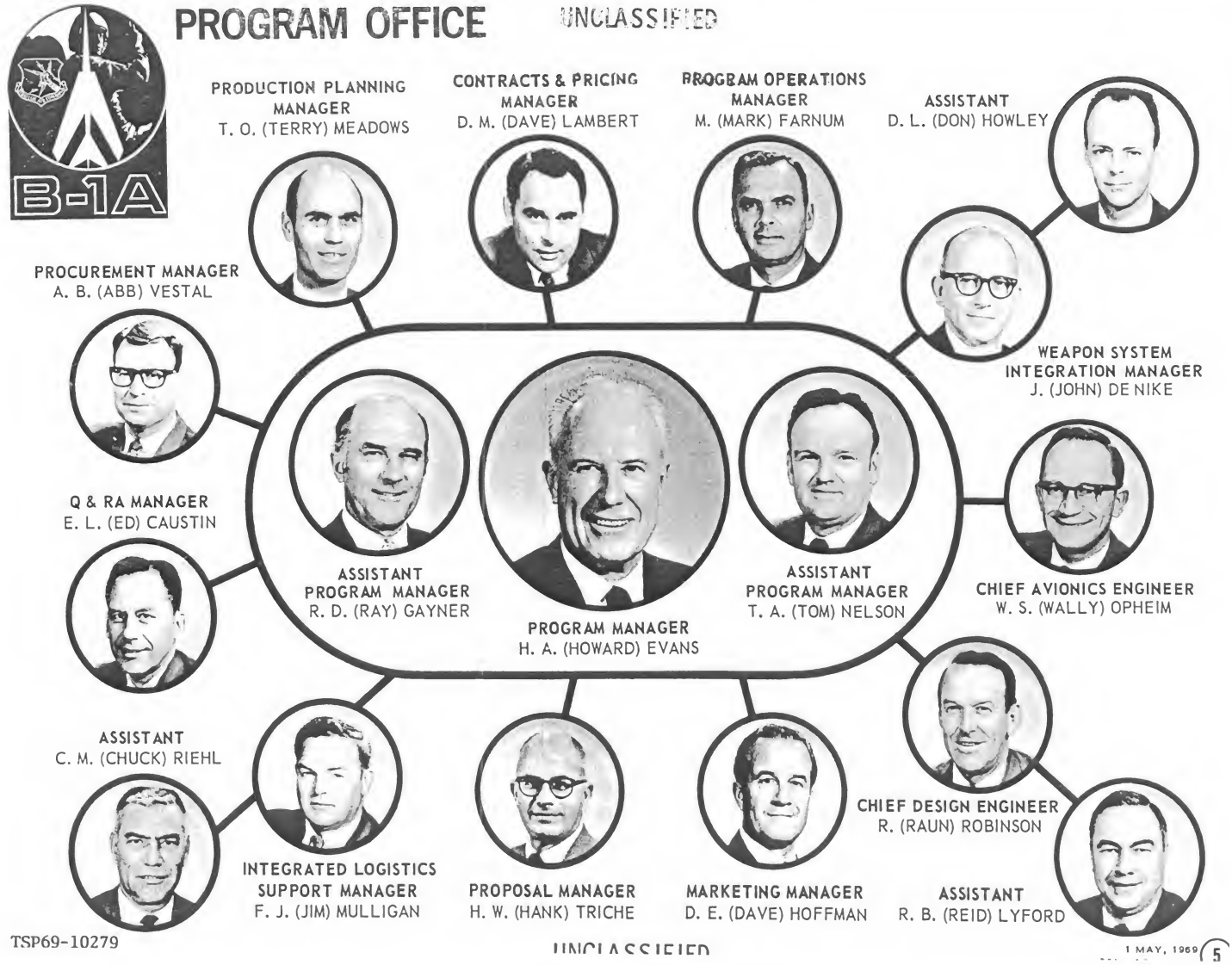
GET YOUR RESERVATION IN EARLY!

The B-1's Proud Legacy and Proud Future

by Scott L. White

The B-1's birth in the late 1960s was the result of a number of bomber studies. These studies enabled North American Aviation/North American Rockwell to garner this competitive win. A win, which was extremely important in light of the F-15 program loss. It was envisioned that the B-1 would strengthen the United States Triad of Bombers, Intercontinental Ballistic Missiles and Sea Launched Ballistic Missiles. The B-1's design would provide an aircraft capable of standing on alert with nuclear weapons, able to react quickly to impending attack, have extended range capability/refueling, operate at speeds in excess of Mach 2, carry large payloads of nuclear short range attack missiles and other weapons, have a crew escape module for the complement of four crew members and be able to penetrate Soviet air defenses. This was all designed to insure that the capabilities of our triad maintained the delicate balance of the Nuclear Cold War and the concept of Mutual Assured Destruction (MAD). This MAD philosophy assumed that neither side would attack if the risk of retaliation and destruction was probable.

The contract award in 1970 for development and future production of up to 244 B-1s began a legacy that remains with the program today (see 1969 organization chart). The contract included three Research Development Test and Evaluation aircraft which was later expanded to a fourth aircraft. In 1976 the Rockwell team negotiated the first production contract. However, on June 30, 1977, President Jimmy Carter terminated the production program while allowing some of the development effort to continue. His arguments seemed to focus on a lower cost approach by using newly developed Air Launched Cruise Missiles. One of his quotes on June 30 stated the following..."The existing testing and development program now underway on the B-1 should continue, to provide us with the needed technical base in the unlikely event that more cost-effective alternative systems should run into difficulty. Continued efforts at the research and development stage will give us better answers about the cost and effectiveness of the bomber and support systems including electronic countermeasures techniques."



B-1A Organization Chart (1969)

Shortly after the production termination, Dr. William Perry, Director of Defense Research and Engineering for the DoD stated... "Basically, the Department has concluded that the B-1 was a well managed program and would have met its technical and operational objectives." This "well managed" tag would continue through the 1970s and 1980s and set the stage for the future objectives of the program.

The addition of Aircraft Number 4 to the B-1 development program eliminated the crew escape module and replaced this system with individual ejection seats. With the restart in 1982 by President Reagan, B-1A Aircraft Number 4 served along with Number 2 as the two flying prototypes for the B-1B program. Other significant changes between the B-1A and B-1B included removing the variable ramps in the nacelle and redesigning the nacelle to incorporate S-vanes and radar absorbing material. This along with a number of other "stealth" improvements reduced the radar cross-section of the B-1B from the B-1 by a factor of 10. This redesign also resulted in a Mach 1.2 aircraft in lieu of the 2.2 on the original B-1A. A higher gross weight from 395,000 pounds to 477,000 pounds and a new moveable bulkhead between the two forward weapon bays provided improved flexibility for carrying the new technology weapons, including the new Air Launched Cruise Missiles. The B-1B design allowed for 8 to be carried internally and 12 to 14 to be carried externally.

Similar to the organization of 1969, the B-1B organization led by Sam Iacobellis from 1982 through 1988 provided the dedication, pride, expertise and leadership needed to complete development of the B-1B and concurrently produce 100 B-1B aircraft. This was accomplished in six years to meet the challenges by President Ronald Reagan which was "to close the window of vulnerability with the Soviet Union as soon as possible." The B-1B production program required ramping up to a production rate of four aircraft per month with the final aircraft being delivered in April 1988 ahead of schedule and under cost. This monumental task closed the window of vulnerability. It has been said by leaders in the Soviet Union that the B-1B played a significant role in the fall of Communism and the end of the Cold War.

The proud legacy of the B-1 team continued throughout the production and delivery process. At Rockwell alone, staffing grew from approximately 7,000 to over 28,000 employees. Since the program was capped at $20.5 Billion (1981 dollars) it was well recognized that the probability of producing more than 100 aircraft was low. In fact, most production programs come down a learning curve (meaning that the cost of the subsequent production unit is less than the previous one due to learning/experience) and will suffer a tail up as the end of production nears. Due in large part to the pride and professionalism of the B-1B team, the people minimized this tail up while recognizing that the probability was high that they might be out of work once the 100th ship set passed their work station. At this point in the B-1B's history, one will recognize that the credit really goes to the people who went over and above to meet diffi-



B-1B Organization Chart (1986)



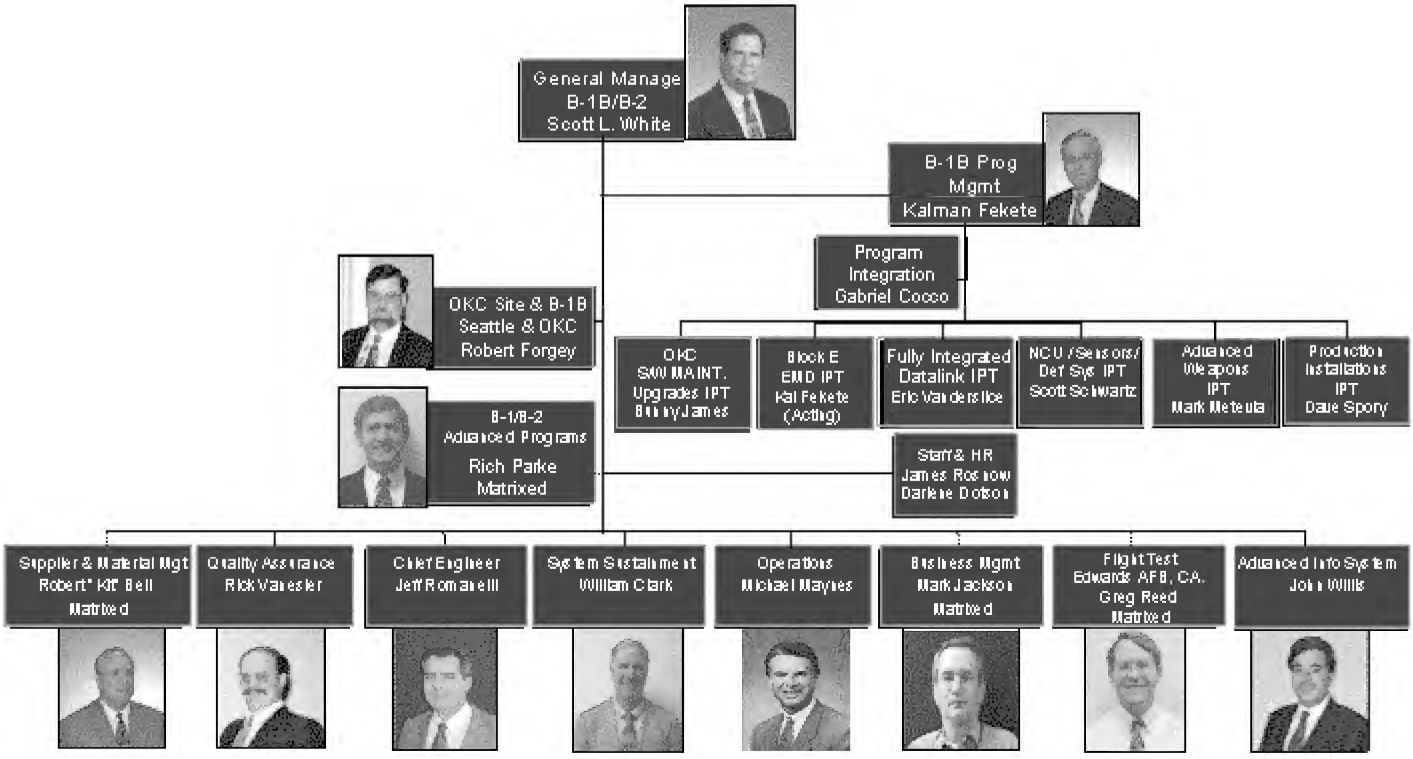
Photo courtesy of Boeing Historical Archives
Rollout of a B-1B (1986)

cult challenges in terms of design, cost and schedule.

Throughout the 1990s and 2000s, this proud legacy continues and keeps a team of approximately 1,000 people working to upgrade and sustain the B-1B fleet. The original complement of 100 aircraft was at 92 in early 2002 when the DoD decided to retire 32 aircraft and take the savings from the retirement and invest into the remaining 60 aircraft. The B-1B 2004 leadership team was concerned that the funding would be diverted to other "higher priority" needs within the Air Force. Unfortunately, this happened and funding for conventional upgrades and sustainment continues at moderate levels. The good news is that numerous conventional upgrades have occurred including new weapons integration such as the Cluster Bomb Unit (CBU), Joint Direct Attack Munition (JDAM) which is a guided by the Global Positioning Satellites, Block E includes new computers, upgraded avionics flight system and the ability to deliver a mixed load of weapons out of the 3 weapon bays. The B-1B's successes in Afghanistan and Iraq over the last two years were accomplished with Block D jets which had the CBUs and JDAMs. The Block E capability will add tremendous flexibility as it becomes operational at the end of calendar year 2004.



U.S. Air Force photo
A B-1B Lancer unleashes cluster bomb unit (CBU) munitions.



B-1B Organization Chart (2004)

In 1977, former Commander of the Strategic Air Commander, Gen. Russell Dougherty (USAF Retired), wrote a letter to Congressman Bill Alexander. The words are both prophetic and amazingly accurate today. He said, "A hardened, long-range, manned penetrating bomber offers a uniquely capable and dependable strategic delivery system that spreads itself reliably and capably across the broadest possible spectrum of those required military capabilities. When completely modernized and manned with skilled, ingenious military crews, such a penetrating bomber offers the United States an overall flexibility of choice and application that is unmatched by any other weapons system."

The names and the organizational structures have changed over the years but the pride in the B-1 program has been a mainstay over three plus decades. It is this proud legacy that feeds the current B-1 team and that fosters a strong commitment to our Air Force customer. The performance of the aircraft has been amazing over the years and the Air Force/DoD leadership understands the important role the B-1B has played. Our expectations are that this proud legacy will lead us to a proud future…one that should last at least another 40 years!!!



U.S. Air Force photo

A B-1B simultaneously releases three Joint Direct Attack Munition (JDAM) weapons.

About the Author: Scott White is General Manager of the Boeing B-1B/B-2 Programs in Long Beach. He began his career in El Segundo in 1972 in Engineering before accepting positions in Contracts, Finance, Program Management and Business Development. Scott was President of a Boeing joint venture company in the Czech Republic from 1998 through 2000 before returning to his current position.



U.S. Air Force photo by Bobbi Garcia

OVER EDWARDS AIR FORCE BASE, Calif. -- The B-1B Lancer soars above the 2003 Edwards Open House and Air Show here. During the performance, the B-1B set 45 new world records for speed and broke five previously set records. These records became official April 30, 2004.

CONGRATULATIONS and BEST WISHES to

Herbert and Ruth Carver of Los Angeles, California
celebrating their 60th Wedding Anniversary

Rainis and Margaret Krigens of Riverside, California
celebrating their 50th Wedding Anniversary

Kenneth and Irene Suponchick of Hemet, California
celebrating their 66th Wedding Anniversary

The Silent Majority

by Stan Guzy



COOPER, L. GORDON, JR., 77 – passed away on October 4, 2004 of a heart condition at his home in Ventura, CA. He was the youngest of the original seven *"Right Stuff"* Mercury astronauts. On May 15, 1963, he orbited the Earth 22 times in 34 hours and 20 minutes in the capsule *Faith 7* for the last and longest Mercury mission. Two years later during the Gemini GT-5 mission, he and Charles Conrad established a space endurance record of more than 3.3 million miles in 190 hours and 56 minutes. He was the backup command pilot for Apollo X. Gordon left NASA and retired from the Air Force as a colonel on July 31, 1970. Among his numerous awards were the Distinguished Flying Cross with clusters, the Collier Trophy and the Harmon Trophy. His caring wife, Susan, survives him.

BARNHART, G. MICHAEL, 52 – died on October 20, 2004 due to a pulmonary embolism following prostate surgery. He worked for NAA/RI for the past twenty years as a computer software engineer on various programs at the Autonetics facility.

BARTH, JOHN L. – of Salt Lake City, UT. Bulletin returned stamped "Deceased". John retired from LAD in 1982 after 35 years of service.

BEAVERS, H. KEN, 80 – passed away on September 2, 2004 in Tulsa, OK after a long battle with cancer. Ken retired in 1981 after 35 years of service in the Model Shop at LAD. He is survived by his loving wife Frances.

BROWN, CLYDE, 86 – of Mission Viejo, CA died on September 26, 2004 due to heart disease. He was a retired accountant for NAA/RI. Survivors include his wife, Carmen.

BRUNNER, JAMES "JIM", 78 – died on April 21, 2004 of a heart attack in Cape Coral, FL. Jim retired in 1986 as a vice president of Accounting at Space Division with 36 years of service. He is survived by his loving wife of 58 years, Thelma.

CANNON, JOHN J., 79 – died of congestive heart failure in Tustin, CA on June 24, 2004. John retired from Space Division in 1984 after 33 years of service. John is survived by his beloved and only wife Betty.

CARTER, DONALD H. "DON", 75 – passed away on November 2, 2004 of emphysema in Peoria, AZ. Don retired from Seal Beach as a director of Material in 1988 after 26 years of service. His caring wife Louise survives him.

COLBENSON, KEITH E., 75 – passed away on August 24, 2004 in Lancaster, CA after a lengthy battle with Alzheimer's disease. He retired as a flight test supervisor after 31 years of service. He is survived by his loving wife Eileen.

CONRAD, REX K., 84 – of Tucson, AZ died on October 15, 2004 of a heart attack. Rex was buried at the National Cemetery in Riverside, CA with military honors. He retired from the B-1 Division in 1979 after 33 years of service. He is survived by his wife of 57 years, Mary Ruth.

COOK, JAMES R. "JIM", 84 – died on October 24, 2004 in Bellflower, CA from complications after knee surgery. Jim retired from Space Division in 1985 after 22 years of service in Reliability and Safety but returned to work part-time on the Shuttle and Delta IV programs. His wife, Kathy, survives him.

DANIELS, CAROL ANN, 70 – passed away on August 15, 2004 of a bacterial infection. She worked in accounting for over 37 years, starting at the Los Angeles Division and transferring to the Seal Beach Facility.

DESPARS, EDWARD J., – of Winnetka, OH passed away at home on October 4, 2004. He retired from Rocketdyne after 26 years of service.

ELLEZY, MARY B., 84 – died on September 24, 2004 of cancer. She had been an inspector at the Autonetics facility for many years. Her husband, Johnnie, survives her.

GRAHAM, ROMEYN G., 83 – died on November 2, 2004 of causes yet to be determined. He had been an accountant at the NAA/RI Autonetics facility. Survivors include his wife, Rose.

HARRERA, DANIEL F., 84 – fell victim to congestive heart failure recently (date unreported). Dan had worked on a variety of programs at several divisions of NAA/RI as a facilities engineer. He had retired after 39 years of service.

HESSELDENZ, JOHN S. – of Palm Desert, CA. Bulletin returned stamped "Deceased". John retired from LAD in 1969 after 31 years of service.

HEWITT, NORMAN W., 83 – passed away on October 5, 2004 in Gardnerville, NV of pneumonia after a short illness. Norm served for 32 years in Space Division in Quality Assurance on the B-1, Apollo, and Shuttle programs. His loving wife of 55 years, Lucille, also a retiree, survives him.

JONES, GLADYS E. – of Coeur d'Alene, ID, died on October 5, 2004 of cancer. Gladys retired from LAD after 25 years of service as an executive secretary.

KING, JR., JULIAN P., 72 – passed away on August 31, 2004 in Sacramento, CA after a long battle with Parkinson's disease. He served as a mechanical engineer for 30 years and resided in Lakewood, CA.

KOMATZ, LAWRENCE J., 62 – died suddenly in Ft. Myers, FL on November 1, 2004. A long time resident of Oakmont, PA, he retired from Rockwell International as a vice president and controller. He is survived by his loving wife Cathy.

LUNDGREN, JOHN E., 82 – died of stroke complications on June 7, 2004 in Laguna Hills, CA. John started at NAA in 1946 at LAD and rose to group leader in Thermodynamics from the P-51 through the F-107 Programs. He subsequently transferred to Space and completed his 36 year career as Manager of Thermodynamics and Heat Transfer for the Apollo and Space Shuttle programs. He is survived by his loving wife of 50 years, Gracia.

MEADOWS, TERRANCE O. "TERRY", 75 – passed away in Santa Maria, CA on September 29, 2004. Terry retired from LAD in 1982 after 35 years of service. He started as a mechanic and ended as a manager of Production Control. His loving wife, Janet, survives him.

MOSELY, FRED L., 83 – passed away of undisclosed causes in Torrance, CA on October 25, 2004. Fred retired as a fireman in Security at LAD in 1987 after 32 years of service. He is survived by his wife of 58 years, Charlotte.

MURILLO, LUCILLE C. "LUCI", – succumbed to cancer in October 2004. An experienced administrative secretary, Luci spent many years in the Purchasing department as secretary to the Division Director. She also served as a confidential secretary to Contracts and Pricing department management. She was considered outstanding, reliable, dependable and extremely accurate in the performance of her clerical/administrative tasks.

O'DONNELL, CEDRIC F., 84 – passed away on April 10, 2004 of undisclosed causes. Cedric worked for NAA where he became Vice President of the Electronic Research Center, and served as President of Autonetics before his retirement. He is survived by his wife of 60 years, Jean.

PASCUZZO, FREDERICK P., 80 – died on September 12, 2004 at home in Huntington Beach, CA. Fred retired in 1992 from Space Division after 31 years of service. His loving wife, Anna, survives him.

PEARSALL, KEITH A. "BUD", 84 – died on September 29, 2003 in Prescott, AZ of undisclosed causes. Bud retired in 1968 after 20 years of service with NAA.

PELLETIER, CONRAD A., 77 – of Torrance, CA died of pulmonary fibrosis on August 4, 2004. Connie was an engineer in the GSE group at LAD and retired in 1985 after 33 years of service. He is survived by his loving wife of 53 years, Lucy.

PETERSON, PAUL F., 85 – passed away in Palos Verdes Estates, CA on October 23, 2004. Paul devoted 38 years of service to armament design including weapons for the P-51, B-25 and P-82. He retired in 1978 as Chief Armament Engineer on the B-1 project.

RUSSELL, MARGARET M., 78 – of Columbus, OH died on July 25, 2004. Margaret retired from Space Division in 1989 after 37 years of service.

TOM, RAYMOND, 85 – of Rancho Palos Verdes, CA died on July 31, 2004 of congestive heart failure. He retired from LAD in 1984 after 25 years of service.

TRABER, MILFORD A., 90 – passed away of natural causes on August 26, 2004 in Marina Del Rey, CA. He joined at LAD in 1950 and retired in 1977 after 27 years of service. He worked on the B-70 and B-1 in planning and budget control.

TERVORT, DALE, 77 – died of a stroke in Antelope Valley, CA on June 17, 2004. He served for 37 years on the B-1 and other projects at the Palmdale Facility. He is survived by his loving wife Lillian.

WAGNER, MILDRED, 88 – died on September 21, 2004 in Whittier, CA from colon cancer. Mildred held various positions in Downey and retired after 30 years from Contract Compliance, Material.

WRIGHT, BARRY L. "BUD", 70 – passed away on October 10, 2004 at his home in Diamond Bar, CA from undisclosed causes. Bud retired as an electronic engineer and technician from NAA/RI Autonetics. His wife Doris, survives him.

RETIREES BULLETIN OFFICE
2600 Westminster Blvd.
P.O. Box 3644, M/C SJ51
Seal Beach, CA 90740-7644

North American Aviation Retirees Bulletin

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IF THE DATE ABOVE YOUR NAME IS DECEMBER 2004 AND YOU HAVEN'T YET RENEWED –
THIS IS YOUR LAST ISSUE!



Photo courtesy of the Boeing History Archives Office

On March 29, 1949, North American Aviation began Project NA-164, the design of an all-weather interceptor version of the F-86. The design progressed so quickly; on April 7, 1949, the company began work on a production version, Project NA-165. The choice of a single seat design required sophisticated electronic systems employing some of the earliest flight computers in aviation. In order to fit the AN/APG-36 search radar in the nose, the nose air intake had to be lowered and reshaped to accommodate the 30-inch dielectric radome covering the 18-inch antenna of the search radar. Three of the first production aircraft, F-86D-1 Sabre "Dogs", are shown flying in formation over the mountain range of California.

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION
Retirees Bulletin

Spring 2005

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by Chuck McKim and Jay White



Photo Courtesy of Tyson Rininger
The fifty year evolution of the U.S. Navy fighter aircraft is clearly illustrated as the last flyable FJ-4B Fury teams up with an F/A-18D Hornet for the Tailhook Legacy Flight held at the US Naval Air Station Lemoore,CA. The pair are scheduled to be the star attraction at many air shows in the near future.

NORTH AMERICAN AVIATION
Retirees Bulletin

NAAR BULLETIN, an affiliate of the **Bald Eagles, Inc.**, is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

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Seal Beach, CA 90740

Or Phone: ☎ (562) 797-3836

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DEAR NAA RETIREE BULLETIN SUBSCRIBER

We begin another year with some great stories from the Columbus Division in Ohio. The NAA people in that facility developed and built some fantastic flying machines. We are very proud of them and their achievements. Although, each article was written individually, one person stands out in all of them. He is Test Pilot Ed Gillespie. He has tested almost every machine built at the Columbus facility and never had to bail out, even though some landings involved a plane on fire or falling apart. Some attribute that to luck. However, if you analyze Ed, you will find a great deal of study, knowledge, focus and the ability to push to the limit without crossing the line of no return.

Our B-17 crew escape in Poland story, Winter 2004 Issue, brought another sequel. Our good friend and former P-38 pilot, Joe Onesty, recognized the two P-38 pilots that flew into Poltava, Russia after one was shot down over Rumania and got picked up by his buddy, completing the mission sitting in his lap. We contacted them and they gave us the details of this terrific story of rescue and recovery. We will add this story to our next issue.

Those of you that ordered Al White's book will recall that he also went down in his P-51 to pick up a friend that was shot down. Unfortunately, his friend took the wrong path and Al had to take off without him from a plowed field which almost caught his propeller and could have flipped his plane over.

Those of you that grew up in the Thirties will remember the movie *Dawn Patrol* about the air battles in World War I in which the hero, Errol Flynn, goes down and picks up his wing man in enemy territory. That was make-believe, this was very real! God has blessed our Nation with some very courageous people that step up to the plate when needed and never look back! We are honored to tell their stories!

Once again, it is time to plan to attend the Bald Eagles luncheon on Saturday, April 16th at the Proud Bird Restaurant. Last year we had a fantastic turnout of NAA/Rockwell people that have not attended before. Many who did not come were sorry when they heard who all was there! So this year, plan to join us for a few hours of good food, fond memories, great friends and warm fellowship!

Several of you have called our number and gotten upset because all you get is the recording. We have informed you last year that we have been downsized by Boeing and we no longer have an office at the Boeing Seal Beach facility. All we have is an answering phone and a mail box. We periodically check the recorded messages and pick up the mail weekly. But all of these things are being done from our homes as a volunteer service. So please be patient with us!

It is difficult for us to increase our readership because we lose so many of you to the Silent Majority. We still have many retirees that do not know that we even exist. If you know of any, why not give them a gift subscription. Do that and we will send them the Winter 2004 Issue as an added bonus with a nice letter expressing your generosity!

THE 43RD BALD EAGLES REUNION WILL BE HELD
ON SATURDAY, APRIL 16, 2005
AT THE PROUD BIRD RESTAURANT
11022 AVIATION BLVD. (AT 111TH STREET)

Doors open for social at 10:00 am
Seating for lunch at 12:00 noon

SEND YOUR CHECK FOR $20.00 PAYABLE TO **BALD EAGLES, INC.** TO:
VAL YARBROUGH
520 DEL ORO DRIVE
OJAI, CA 93023-1805
(805) 646-2283

Include with your check the name you wish on your badge and the name of each guest included in your payment. Tickets and badges will be issued as you register at the door. Seating is limited so order your tickets early. No tickets will be sold at the door. Sorry, no refunds after March 28, 2005.

There are no service requirements to attend – Just the love for Airplanes and Spaceships – Meet old friends – Make new ones! Parking is limited—Carpooling and early arrival is encouraged!

NAA/ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Frank Zelinski at (562) 866-3195.

The Antelope Valley Retirees Club meets in the South Meeting Room of the Palmdale Culture Center at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell/Boeing retirees are welcome. For information, contact Bill "Tiny" Kistler at (661) 273-0213.

Boeing Valley Retirees Club meets on the 3rd Thursday of each month at the Canoga Park Rec Center, 8500 Fallbrook Avenue, Canoga Park, CA. The president is Duane Buckley at (818) 881-2655.

Boeing Valley Retirees Club also meets on the 1st Wednesday of each month at 8:00 AM for breakfast at IHOP Restaurant, corner Fallbrook and Vanowen in West Hills. Contact Howard Seese at (818) 344-7861.

"The Old LAD Stress Group" meets for breakfast approximately every two months at Mimi's Café in Torrance, CA. If you are from the old LAD Stress Group contact Gene Laxton at (310) 378-3113 or Ed Rosenthal at (310) 375-8933.

"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meet at 11:30 AM on the 2nd Wednesday of the month for lunch at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd and Mariposa Ave.

The NAA 101 Tooling Retirees Group meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at Billy's Restaurant, 5160 190th St., west of Anza Avenue in Torrance, CA.

GPS Breakfast Club meets from 6:00 AM to 8:00 AM every Wednesday at the Primrose Restaurant, corner Seal Beach Blvd. and Westminster Blvd. All are invited. For more information, call Fred Shitara at (714) 750-1016.

Seal Beach Retirees Group meets at 11:30 AM on the 3rd Wednesday of the month at "The Fish Co". on Los Alamitos Blvd. at Katella Avenue. For more information call Marvin Blaski at (714) 848-5717 or e-mail to *mblaski@aol.com*.

The Facilities, Industrial Engineering and Plant Services Retirees Group meets at 11:45 AM on the 2nd Thursday of each month at Buster's (formerly Jolly Rogers) Restaurant in the Long Beach Marina. Contact Joe W. Mausser at (562) 596-5845.

"Ye Olde Pharts Breakfast Club" meets at 10:00 AM on the 4th Thursday each month for breakfast at Polly's Pies at 2025 N. Tustin Avenue in Orange. For information call Don Metzger at (949) 495-5374.

The North American Rockwell Retiree Club of McAlester, OK (a satellite of Tulsa, OK) meets at 10:30 AM on the 3rd Tuesday in March, June, September and December at the Down Town Meeting Place. Call J.A. Darden at (918) 423-0706 for more information.

Tulsa & McAlester Retirees meet for breakfast at 8:00 AM on the 2nd Monday in March, June, September and December at the Ramada Inn, 8181 East Skelly Drive in Tulsa, OK. Call Harry Phillips at (918) 838-3716.

The North American Rockwell Retirees Group of Columbus, OH Engineers and professionals meet at 11:30 AM on the 3rd Thursday of each month at the Berwick Park House. Contact Byron C. Solomides at (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH meets at Noon on the 1st Monday of the month at the Whitehall Community Park on North Hamilton Road in Whitehall. Contact E. Hamilton at (740) 927-5940 for information.

Autonetics Group including Marine Systems, Program Office, Project Office, System Test, Engineers and Designers meets for lunch on the last Wednesday of each month at the HomeTown Buffet, Rose Avenue and Alta Vista Drive in Placentia, CA. Call Mike Vohs at (714) 762-1925 for more details.

Autonetics Industrial Engineering and Maintenance Retirees meet for lunch on the 1st Thursday of each month at the HomeTown Buffet, 390 McKinley, located in front of the Home Depot, in Corona, CA. For more details, call Don Burk at (909) 698-0072.

Autonetics Flight Control Retirees meet at 11:30 AM on the 3rd Thursday of each month except in December at The Lamppost Pizza House located at 17568 Yorba Linda Blvd., corner of Richfield Road, in Yorba Linda, CA. Call Jim Anderson at (714) 779-5620 for details.

Autonetics Retirees meet for lunch at 11:45 AM on the 2nd Wednesday of every month at the Rembrandt Restaurant or Yorba Linda Country Club. All Autonetics retirees, spouses and friends are invited. Contact Robert Nease at (714) 516-1844 or e-mail to *rfnease@email.msn.com* or Ed Venanzi at (714) 779-5652 or e-mail to *EdVennz@aol.com*.

A Group of NAA Retirees meets for breakfast at 8:15 AM on the 1st Wednesday of each month at Knott's Berry Farm-Chicken Restaurant. All are cordially invited. Contact Maxine Haun at *maxi3131@sbcglobal.net*.

Autonetics Financial Luncheon Group meets for lunch at Noon on the last Wednesday of the month at Marie Callendars, 126 East Yorba Linda Boulevard in Placentia. Contact Ken Cantwell at (714) 970-7171 or e-mail *Kcantwell@adelphia.net*.

A Group of Engineering Mgt. meets at 11:30 AM on the 3rd Tuesday of the month for lunch at Denny's on Imperial Hwy. and the 57 Fwy. Call Ed Moran at (562) 697-9949 for information.

NAA Tech Reps Assn. (TRA) Breakfast Club meets at 9:00 AM on the 1st Tuesday of each month at the Carlsbad Airport Restaurant. For more information, call El Presidente Rafael Colunga at (760) 940-0525.

Material Group retirees from Downey and Seal Beach meet at 11:30 AM on the 4th Wednesday of every month at the Stox Restaurant at Imperial Hwy. and Bellflower Blvd. in Downey. Contact Marian Nielson at (562) 429-1020 or Joan Dominguez at (562) 865-7200 or e-mail to *tatedom@aol.com* for information.

Rockwell Vandenberg AFB Retirees Breakfast Club meets at 8:45 AM on the 2nd Tuesday of each month at the IHOP Restaurant in Santa Maria. Contact Marv Bailey at (805) 929-6552 or Al Finlay at (805) 937-3690.

ANNUAL EVENT

Bald Eagle 43rd Annual Reunion – will be held on Saturday, April 16, 2005 at the Proud Bird Restaurant. Call Val Yarbrough at (805) 646-2283.

The Hangar Gang B meets at the Proud Bird approximately every 4 months. For time, date and other details, call Gene Salvay at (818) 788-3974 or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

Flight Test Instrumentation Annual Reunion – meets annually at the Fullerton Elks Club. For information, call Frank Vigil at (562) 691-0236.

Tech Rep Association Picnic – A group of retired Field Service Technical Representatives has a yearly picnic in June at a park in Fallbrook, CA. For more information, call TRA President Rafael Colunga at (760) 940-0525 or e-mail to *rafael@nctimes.net*.

The Annual M&P, P.D.L., "Friends Christmas Luncheon" – This group of retirees and employees have assembled in mid-December for a festive luncheon and gabfest for the past 20 years. Those wishing to participate and receive notice of the next December luncheon, call Fred Koeller at (310) 545-8854.

NAA-K B-25 Reunion will be held on Sunday, August 21, 2005 from 1:00 PM to 5:00 PM at the Wyandotte County Museum in Bonner Springs, KS. For more information, call Harry J. Desko at (913) 287-7223 or write to him at 3024 N. 47th St., Kansas City, KS 66104.

Grants Pass NAA/RI Retirees Picnic will be held on Wednesday, September 7, 2005. Contact Bob Morse for details at (541) 474-1438 or e-mail to *lindabob2@earthlink.net*.

NAA Flying Horsemen will hold their annual reunion on Friday through Sunday, September 9 through 11, 2005 at the Bob Morse's home in Grants Pass, OR. Contact Bob Morse for details at (541) 474-1438 or e-mail to *lindabob2@earthlink.net*.

Unleashing The Fury

by Erik Simonsen

First flown on September 11, 1946 the North American Aviation (NAA) XFJ-1 *Fury* (NA-141) became the first carrier borne jet to complete flight operations two years later. It had one disadvantage—it had a straight wing configuration to accommodate the U.S. Navy's need to retain the stability required for precise slow-speed handling. However, the high-end performance was severely penalized.

Meanwhile, in a concurrent Air Force program; NAA using captured German WWII data, managed to convince the Customer to go with a swept wing on the XP-86 Sabre Jet. The Sabre Jet first flew on October 1, 1947, and seven months later it broke the sound barrier. Such performance convinced the Navy to go with swept wings on its *Fury* series.

Initially, three USAF F-86Es were acquired and designated the XFJ-2. This was followed by the FJ-2 with additional modifications, including folding wings, beefed up landing gear, modified canopy, arresting equipment and installation of four 20mm cannons each armed with 150 rounds. One of the main issues concerning the air-to-air combat performance of the F-86 in Korea, was the lack of punch of its six .50 cal. machine guns. The MiG-15 was equipped with a single 37mm and two 23mm cannon with a low firing rate, but they packed a wallop. Thus, the U.S. Navy Fury FJ-2, -3, and -4 series sported four 20mm cannon. Top speed of the FJ-2 was 697 mph with a combat range of 990 miles.

The FJ-3 first took to the air on July 3, 1953, and after entering fleet operations enjoyed steam catapults, angled carrier decks and a new mirror landing system that augmented the Landing Signal Officer (LSO). In early 1955 the *Fury* began to dispense with the dark Navy blue markings in favor of a light gull gray on the upper fuselage/wings, and the lower fuselage/underside-wings in gloss white. The modified FJ-3M was wired for the next step in weaponry—air-to-air missiles.

On October 28, 1954, the FJ-4 made its first flight from the Columbus Division field. With a wingspan of 39.1 ft and a length of 36.4 ft, the favorite *Fury* of the series was described as very effective and a great handler in the pattern around the carrier. The FJ-4 was the first *Fury* developed separately and not patterned off the F-86, as indicated by its distinct vertical tail. Two years later, a fighter/bomber variant, the FJ-4B was first flown on December 4, 1956. It also featured a 'wet wing' with a 50 percent increase in internal fuel capacity, which was great for an extended combat radius. However, the wings did leak extensively.



Photo from the Erik Simonsen Collection

Two FJ-3s of U.S. Marines VMF-122 reveal the four 20mm cannons that marked a vast improvement over the .50 cal. machine guns installed in the original F-86s.

During the "Cold War" the FJ-4B perfected a pop up maneuver and lob technique, known as LABS (Low Altitude Bombing System) to deliver nuclear bombs. In 1957, two *Furys*, designated FJ-4Fs, were fitted with a Rocketdyne AR-1 rocket engine located just above the exhaust nozzle. A series of flight tests at NAS Patuxent River, MD, achieved Mach 1.41 and a maximum altitude of 71,000 ft. However, no production of the *"Rocket Fury"* was ever initiated.

Meanwhile, North American engineers were kicking around the idea of a final version, the FJ-5, to compete with the Grumman F11F-1 *Tiger*, which later proved to be considerably underpowered. Although it never got beyond the drawing board, the FJ-5 would have had the intake located above and behind the cockpit analogous to the NAA/USAF F-107A—but that's another story.

North American's Columbus Division turned out 1,148 FJ *Furys* for both the U.S. Navy and Marines. Although entering service after the Korean War and prior to Vietnam, history substantiates that the *Fury* was an important and crucial milestone in the transformation of naval aviation.

About the Author: Eric is well known by our readers for his splendid series of concise "Peek at the Past" articles about NAA aircraft. The communications manager for Boeing Air Force Systems, he is an avid aviation photographer using creative photography to illustrate aircraft and spacecraft. His work has appeared in several publications and the two books he authored.



Photo from the Erik Simonsen Collection

Concern for high approach speeds during carrier operations affected the FJ-1 straight wing design. Although only 30 aircraft were produced, they paved the way for the swept wing designs that followed.

The Last Fury Flying

by Richard Sugden, M.D.

This particular North American FJ-4B BuNo 143575, the only flying example in the world, was built in 1958 in the second to the last batch of 222 aircraft. It was delivered to VA-192 "Golden Dragons" serving on board the *USS Bon Homme Richard*. It operated with several other US Navy squadrons, the last being VA-116, the "Black Diamonds" aboard the *USS Hancock* in Vietnam.

It was then retired to Litchfield Park, AZ for disposal and somehow missed demolition. In 1971, Bill Laidlaw, the President of Flight Systems in Mojave, CA and a former NAA test pilot, was searching for an aircraft that would stay subsonic in a near vertical dive from 50,000 ft and came up with the idea of using the FJ-4B. The aircraft has four large speedbrakes, that were part of the LABS system, and these provided sufficient drag to keep the aircraft subsonic.

His requirement came from a civilian contract to test the radar pattern matching guidance system of the Pershing II intermediate range ballistic missile. As a result, the plane was restored to flight status and flew over 77 hours of roller-coaster, reentry paths to measure the ability of the Pershing warhead, hung beneath the wing, to guide itself to various targets around the country. While operating with Flight Systems, the plane was registered as N400FS, the registration it bears today.

When the Pershing program was completed, the plane was again retired, this time to Mojave. There it remained until 1991 when Larry Mockford of T-Bird Aviation purchased the aircraft and started restoration. I obtained the *Fury* from Larry and completed the restoration in 2002 and finished the restoration with Scott MacDonnell, the aircraft's former crew chief and mechanic, at Mojave. The project was then moved to Teton Aviation in Driggs, ID for the final phases of restoration and the avionics installation. The magnificent *Fury* has made its home in Idaho ever since.

The paint scheme is that of the FJ-4s of the Fleet Air Gunnery Unit at NAS Miramar in San Diego, CA. It was chosen for its uniqueness as well as to honor all FJ pilots who undertook their gunnery training at FAGU Miramar.



Photo Courtesy of Tyson Rininger

The markings applied to N400FS, formerly BuNo 143575, depict the FJ-4s of the Fleet Air Gunnery Unit based at NAS Miramar, San Diego, California.



Photo Courtesy of Tyson Rininger

The beautifully restored FJ-4B Fury flies above the flight line at NAS Lemoore, California.

Although I had flight experience in two other swept wing jet aircraft, the MiG-15 and Alpha Jet; there were no LOA qualified *Fury* pilots available, at the time, to assist me in learning to fly the airplane. That being the case, I hired Dick Lawyer, a retired USAF F-100 and F-86 pilot who works at the National Test Pilot School in Mojave, CA to head up the test flight program.

Ed Gillespie, a former US Navy Test Pilot School graduate and former North American chief test pilot, agreed to act as my instructor. He had done much of the test work on the original FJ-4, including the entire upright and inverted spin testing. He was able to obtain an LOA certificate but had to get current in single-engine jets once again before he could begin his training.

After completing study of the NATOPS, Gillespie flew the FJ-4 several times exploring the flight envelope and completing multiple "touch and go" landings and SFO approaches. After each flight, the team would debrief and discuss the handling characteristics encountered during the maneuvers he flew. This allowed me to become familiar with the aircraft before my first flight.

My first flight was anti-climactic. Ed took off first in the T-2 *Buckeye* and picked me up just as I stabilized in a climb. We went out to the local practice area and went through a full handling profile that included slow flight, approach to stalls in various configurations, stalls and then simulated landing patterns at altitude.

While landing, I noted a peculiar handling quality due to the four speed brakes. The two that extend beneath the aft fuselage would hit the ground during landing or takeoff; so they automatically retract when the gear is lowered and that produces a noticeable pitch up, which requires a significant amount of rapid nose-down trim to counteract the angle of attack.

The FJ-4 has a unique pitch trim system that uses a thumb wheel on the stick to directly select a stabilator position (irreversible hydraulic flight controls), and can be operated at whatever rate the pilot desires.

The Last Fury Flying

(continued on page 12)

The OV-10 "Bronco"—A Tough Workhorse

by Emerson W. Smith

The Columbus Division of North American Aviation won the competition with Proposal NA300 to design and produce the airplane designated as the OV-10 in August 1964. The procurement contract required that engineering would be done by a group exclusively committed to this program.

The design was accomplished by approximately sixty-five engineers who made no detail drawings, only layouts and subassemblies. Loftsmen were located next to the engineers to etch into aluminum sheets the tool shapes to produce the detail parts. This close coordination expedited the manufacturing process.

The OV-10 was a special project because its concept was perceived and approved by the Navy, Air Force and Army, as a "tri-service" specification called "LARA", for Light Armed Reconnaissance Aircraft, calling for a new type of "jungle fighting" versatile light attack and observation aircraft. The existing aircraft, the O-1 and O-2, were considered obsolescent, with too small cargo capacity and flexibility.

Basically, the OV-10 consists of a central nacelle containing pilots and cargo, and twin booms housing twin turboprop engines and connected by a horizontal stabilizer. The cockpit has extremely good visibility for a tandem pilot and copilot with a wrap-around "greenhouse". The bottom of the fuselage contains sponsons with four 7.62mm M-60C machine guns. The sponsons also have four racks to carry bombs, pods or fuel. The sponsons are "stub wings", mounted at a downward angle to assure that stores carried on the sponsons are jettisoned cleanly.

Perhaps, the best indication of the toughness of this aircraft; all of the OV-10s built which have not been shot down or crashed, with the exception of the few displayed in air museums in the United States and Europe, are still flying today in firefighting and counterinsurgency capacities.

The primary missions are visual armed reconnaissance, target marking, escort and protection of helicopters, destruction of enemy helicopters, adjustment of ground fire, coordination of tactical aircraft and close-air support of ground troops. Secondary missions are transport of personnel and cargo. The cargo space can accommodate five combat-equipped paratroopers or up to 3,200 pounds of cargo.

The operational environment in which the missions must be performed dictated many details of the design. Short takeoff and landing distances on unprepared surfaces in remote locations and surrounded by 50 foot trees required a rugged aircraft structure with a simple flight control system.

Maintenance requirements were held to a minimum. One airplane located near Cambodia operated for about one month with one man-hour of maintenance for each flight hour. Two ground support men refueled the airplane from drums hand pumped into the bullet sealed tanks, and rearmed it with bombs, rockets, and machine gun ammunition. The ground support could be carried in the cargo compartment.

The unprepared field was expected to be rough and probably soft. The three-wheel landing gear are trailing-link leveraged, using large tires to minimize ground pressure to approximately that of an elephant. The test program at the Patuxent



Photo from the NAARB Photo Files

A USMC OV-10A revved up on the tarmac in Vietnam ready to scramble to assist ground forces in the jungle.

River U.S. Navy Test Center included landings and takeoffs at or about 100 knots on a specially constructed runway with sine waves thirty inches high on six hundred-inch spacing.

The test pilot, Ed Gillespie, requested a broad white stripe for the length of these "bumps" and he was strapped in using lambs wool pads under wider shoulder straps. Two mechanics helping with the strapping-in, posed the question, "Does this hurt?" His response, "Yes". Their next question was, "Can you breathe?" When he answered, "Yes". They followed with, "Have a good flight." As he reported later, "The airplane had no problems but I did!" Those "bumps" gave the airplane the name "Bronco".

The two Garrett AirResearch T76 engines were installed "upside down" to increase ground clearance of the Hamilton Standard propellers. They had to produce maximum thrust both aft and forward to meet takeoff and landing distances. To accomplish this, the propeller blades rotated completely. The spinner was so full of gearing that only three blades could be provided. The propellers were counter rotating to improve single engine flight. The throttle levers operated in an arc from Forward, through Idle, to Reverse only when the quadrant Idle stop was removed by the landing gear load switch indicating the wheels were on the ground.

Four equal length flap panels, between the fuselage and boom and outboard of the booms were essential to the takeoff and landing distance. With the flaps in takeoff position and the engines at full power the weight of the airplane on the landing gear was reduced by half. The wheel brakes held the airplane. When released a "jump-start" was effected.

The matching of engines and propellers is controlled by Condition Levers, inboard of the throttle levers, in the quadrant. A "gear shifting" mechanical cable system provides control as marked on the quadrant: TO/Land, Normal Flight, Feather and Fuel Shutoff. The primary function of the Condition Levers is to permit selection of any engine power setting at high propeller rpm for rapid thrust transients and to manually feather the propellers and shut off fuel to the engines.

Upon takeoff, the airplane must have the capability to make a 90 degree bank in one second. This is tantamount to sawing the down-wing off. Four fan shaped spoilers in each wing pop out after the ailerons deflect 15 degrees. In combat, pilots reported bullets going over the canopy instead of hitting them because the airplane rotated about the high wing tip, instead of rotating symmetrically. Pilots were careful to not use the spoilers at high speed.

Both the pilot and copilot were provided rocket propelled ejection seats. The copilot could fire his seat independently. However, if the pilot elected to fire his seat, the copilot went first followed by the pilot 0.4 seconds later. The nozzles of the ejection rockets were angled to stabilize the trajectories of the seats upright and forward.

Each parachute was in a rectangular fabric container on the back of the seat. By placing the parachutes on opposite sides of the seats the two trajectories were on opposite sides of the airplane in order that, upon separation from the seat, the seat would clear the other parachute. The escape system was demonstrated to have the capability of recovering both crewmen from zero speed and altitude to 450 knots above 27,000 feet.

In Vietnam, the U.S. Navy operated fourteen OV-10A Broncos and a small support unit as "Light Attack Squadron" designated VAL-4. The Broncos patrolled and scrambled in pairs of two. After a few weeks, the aircraft carried a central fuel pod to extend their loitering time, a 4-missile Zuni pod outboard on each wing, the four machine guns for suppressive fire and a flare dispenser. With their low speeds and great visibility, the Broncos often finished a requested fire-mission and left before the USAF TACAIR jets arrived.

The Marines used the OV-10A along the DMZ in Vietnam flying all types of missions. The men on the ground said their "drone" overhead all night was very comforting, knowing that they could call for flares, rockets and bombs as required. On some occasions, the OV-10's machine guns were fired within a few yards of the picket lines to stop the enemy's advance.

The Navy used OV-10s in the Mekong River delta region. One wing received three unit citations for defending a Vietnamese village with no ground defense available all night over a period of weeks. One airplane would drop flares for the second airplane to make his attack while the third airplane was being rearmed and refueled.

Chief Test Pilot Ed Gillespie, Columbus Division of North American Rockwell Corporation, summarized the OV-10 with this comment, "When not being shot at in combat or on GCA final at night in thunderstorms, pilots will find the Bronco a fun airplane to fly because of its wide speed range, rugged structure, crisp maneuverability, and outstanding visibility. The characteristics and the airframe component arrangement enable the Bronco to do a multitude of jobs with the workload on the pilot eased due to stable, responsive, and safe flight characteristics."

About the Author: Emerson Smith began his engineering career in 1944 working on the P-51C water/glycol cooling system. After service in the Navy, he returned to NAA to work on the fuel systems for the F-86, B-45 and F-J1. He earned an MS at Cal Tech, served as an assistant professor of mechanical engineering at the University of Virginia for three years before returning to NAA at the Columbus Division. During his 17 years in Columbus, he was Chief of Powerplant on the Fury, Vigilante and Buckeye programs. He was the Chief of Engineering on the OV-10A and the Z which had a jet engine above the wing hoist fittings. Emerson retired to Charlottesville, VA.

Coming in the Summer 2005 Issue

P-38 RESCUE IN ROMANIA

by Richard Willsie and Richard Andrews

The dramatic account of a P-38 pilot landing in enemy territory and rescuing another P-38 pilot as told in their own words by the men themselves.

This is not a North American Aviation story but it is a great American story!

Ed Gillespie, The Energizer Test Pilot

By Jim "Stoof Driver" Shaw

It has been more than 55 years since 76 year old Ed Gillespie logged his first flight in a Navy airplane, an SNJ at North Whiting Field, Florida in March 1949. Today, he is still practicing his sometimes dangerous profession in high performance aircraft, but on a reduced scale. Until 2003, he was doing all of the test flights of U.S. Navy T-2C Buckeyes which had been completely dismantled and then rebuilt at the Sabreliner Overhaul Facility in Missouri. His task was to deliver the airplanes back to their assigned stations at NAS Meridian, NAS Pensacola, or the Test Pilot School at NATC in Maryland. He maintained currency by flying approximately 100 flights a year in the Buckeyes and, of course, completing the FAA and U.S. Navy annual flight and physical exams.

Ed Gillespie became involved with aviation at an early age and soloed at the age of 16 in a Piper Cub in September 1944, at a small airfield near his hometown of Ann Arbor, Michigan. He enlisted in the U.S. Navy Aviation Midshipman Program as a 17-year-old while still in high school. After schooling in Engineering, at Syracuse University and Western Michigan University, he began Navy preflight training in the summer of 1948, having already logged 200 civilian flight hours. He completed flight training without getting a "down" and successfully qualified for carriers in SNJs and F4U Corsairs aboard the carriers *USS Wright* and *USS Cabot*. He earned his Wings of Gold, in May 1950 and was selected to attend Jet Transitional Training (that was a choice assignment back then), while still a midshipman. The airplanes utilized for that training were single-seat Air Force P-80 Shooting Stars designated as TV-1s since there were no two place jet trainers at that time.

Fleet duty, as a carrier based F2H Banshee pilot, took place over several oceans and aboard many ships during the next three years. He flew 80 combat missions in Korea during this time period and as a high time pilot in the F2H, he also served as the technical director and pilot for four U.S. Navy training films demonstrating how to fly the Banshee. This assignment almost cost him his life during the filming of a low altitude intentionally inverted spin when he finally recovered from the spin barely above the surface of the ocean. At that time, he naively did not realize that the contractor had not tested inverted spins in the Banshee.

After three years of squadron duty with the Rippers of VF-11, Ed was offered the very envious choices of joining either the elite Blue Angels or attending the prestigious U.S. Navy Test Pilot School. He decided it would be better for his career to study aeronautical subjects rather than enjoy the airshow circuit. He graduated from the Navy Test Pilot School in Class Eleven, early in 1954.

Assigned to Patuxant River as a test pilot, he was involved in carrier suitability and weapons testing and flew every propeller and jet fighter/attack airplane in the Navy's inventory. Ed is a charter member of the "4C" Club, the exclusive group of pilots that have flown the F4U Corsair, F7U Cutlass, F-8 Crusader, and the A-7 Corsair II. Before the F7U Cutlass entered the fleet, Ed was one of the high-time USN pilots assigned to this infamous plane. Although others despised the airplane, he really liked it. He attributes its rugged airframe to probably saving his life on at least two occasions.



Ed Gillepie in the cockpit of a rebuilt North American Aviation T-2C Buckeye.

Following his 1956 graduation from the U.S. Navy Line School in Monterey, California, Ed left the active duty Navy and joined North American Aviation in Columbus, OH, as an experimental test pilot. He still had to deploy regularly, since nearly half his time would be spent flying contractor test flights at Patuxent River, Lakehurst, China Lake, Edwards AFB and Albuquerque, NM.

In 1964 he applied for the Astronaut Program when it was first opened to civilians, but was disqualified since he was three months beyond the maximum age limit, which at that time, was 36. However, that same year he became the Chief Test Pilot at North American Aviation. This happened, unfortunately, as a result of the tragic death of one of his best friends during a test flight.

During the next 32 years, Ed performed experimental flying almost on a daily basis. He flew in all series of the T-28 Trojan, T-2 Buckeye, FJ-4 Fury, A-3J/RA-5C Vigilante, AJ-4 Savage, OV-10 Bronco, F-4 Phantom, F-101 Voodoo and other lesser known but just as challenging aircraft types in flight-testing. Hundreds of these flights were at or approached the estimated maximum

limits for the aircraft. Additional flight training later became necessary in the vertical lift realm and it was obtained when Ed went through the U.S. Navy helicopter training program. This qualification allowed him further opportunity to successfully qualify in the AV-8 Harrier and the experimental XFV-12A VSTOL.

Most importantly and impressively, he stayed in the active U.S. Naval Air Reserves for 26 years, concurrent with his civilian flying career. His leadership eventually earned him the honor to be the Commanding Officer of an A-4 Skyhawk squadron. His polished skills were also utilized as an experienced Instructor at the U.S. Naval Test Pilot School. For Ed's last several assignments on his Annual Training Duty periods, he acted as the Commanding Officer for Reserve Units NAS Brunswick, NAS Oceana, and NAF Loges (Azores). In 1982, he retired from the Naval Air Reserves as a Captain with 36 total years of service.

After retiring from Rockwell International in 1988; Ed assumed realistically that no one would hire an aging test pilot. However, it quickly became evident that his experience and knowledge was a priceless commodity. He was soon employed to develop a test program and complete the structural and flutter flight tests on a major modification of the Air Force T-37. To satisfy the Air Force that a 62 year old Naval Aviator could still safely fly a jet, he completed a three-month flight training program for the side by side jet at Randolph AFB, TX. He also established a record of a different sort. This made him the oldest graduate ever of pilot training at Randolph.

After two years with the "Tweet", the Cessna T-37, he did flight test work on a French designed amphibian biplane. Most of this was done while flying from Canadian lakes and seemed to be more fun than dangerous. However, another pilot was later killed in the airplane and the experimenting ended. Concurrently, he also flew first flights in several WWI replica biplane fighters. This effort lasted nearly two years and proved to Ed that the airplanes of that era were indeed underpowered, very structurally limited and marginally stable.

Ed began a lengthy flight test program on a civilian single-engine jet in the mid-'90s. It looked like a small F-18 and climbed like one! It was powered by a 3,000 lb thrust engine and weighed a mere 4,000 lbs. This gave great performance and was a real screamer that provided plenty of unwanted adrenaline rushes with Ed at the controls. Most of the testing was done at the Civilian Flight Test Center at Mohave, CA, and proved very exciting flying. Ed demonstrated the capabilities of this airplane to the U.S. military. However, a fatal crash of a skilled, but impatient, ex-fighter pilot almost ended the program. With additional engineering, Ed resumed flight testing the plane with another company near Lake Tahoe, NV. Unfortunately, due to a mechanical failure, the president of the company was also killed in the airplane. This accident did end this promising program.

Ed was elected a Fellow in the Society of Experimental Test Pilots in 1977, but he has never been in the right time frame or position to participate in any high visibility programs, such as space flight. On the other hand, he is a work-a-day test pilot who has always managed to complete the often scary and mundane test tasks and deliver the required engineering data without losing the airplane. None of the hundreds of test programs he has flown were without risk and most required him to establish the airplanes operating limits. A risky business, you bet!

It is believed that Captain Ed Gillespie has served the U.S. flight test community longer, continuously, and obviously very successfully (he is still living!), than any other civilian or military pilot. He is very proud of the fact that he has always landed every airplane that he has taken off in. Some of these planes were not all in one piece or were on fire, but they all got back with him still strapped in the pilot's seat. Having been within microseconds of buying the farm more than several times during his long career, Ed credits his survival on a combination of good flight planning, conservative flying, moderate skills, and lots of luck!

Ed now has 14,000 plus hours of flight time, almost all of it in single-pilot military airplanes. He has accumulated 200 straight-deck CV carrier landings and 400 angled deck carrier landings. He also has been qualified in over 100 different types of jet, reciprocating, helicopter, turboprop and VSTOL aircraft for the U.S. Navy, Marines and Air Force during his career.

NAA engineering retiree Darell Todd helped Ed build his own Vans RV-9A all-metal two-seat home built airplane. Ed just completed the test flight of this aircraft and is looking forward to years of pleasure flying. The craft uses a Subaru Outback engine with a single ignition system, an electric variable pitch propeller and the same standard computer used in the stock Outback wagon. It also has a liquid cooling system that consists mostly of the Subaru automobile heating system. After 55 years of high risk flying, Ed still enjoys an occasional flight in a T-2 Buckeye. He resides with his wife in Reynoldsburg, OH.

About the Author: Navy Reserve retiree Capt. Jim "Stoof Driver" Shaw is the current Executive Officer of the Association of Naval Aviation's Hell Diver Squadron located in Columbus, OH. He last flew the Grumman S-2 tracker aircraft, an anti-submarine hunter, which was retired in 1976. He was an industrial engineer at the NAAO plant and was responsible for many activities associated with the B-1B aircraft parts built at the Columbus facility. He resides with his wife in Westerville, OH.

CONGRATULATIONS and BEST WISHES to

Chuck and Mildred McKim of Clifton, Colorado
Celebrating Their 63rd Wedding Anniversary

Gus and Maxine Ruppert of Mission Viejo, California
Celebrating Their 65th Wedding Anniversary

Jay and Bea White of Gardnerville, Nevada
Celebrating Their 62nd Wedding Anniversary

Apollo Revisited

by Chuck McKim and Jay White

"I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to the Earth".

—President John F. Kennedy, addressing a joint session of Congress, May 25, 1961

Those challenging words were answered emphatically and resolutely for the next decade by thousands of dedicated aerospace pilots, scientists, engineers, technicians and workers.

It's been over 35 years since the first Apollo moon landing on July 20, 1969 by Apollo 11. Of all the Apollo flights that followed, none captured the attention of worldwide viewers as when Astronaut Buzz Aldrin spoke the words, **"Houston, Tranquility Base here. The Eagle has landed"** followed a few hours later by Astronaut Neil Armstrong when he descended the ladder to the moon's surface and said, **"That's one small step for man, one giant leap for mankind"**.

Several manned Apollo flights had taken place in preparation for the moon landing flight. The first, Apollo 7, an earth orbit flight, qualified the Apollo spacecraft for manned lunar flight. Apollo 8, first flight with Saturn V, made the first lunar orbit. Apollo 9, an earth orbit flight, qualified the Mobile Quarantine Facility (QF) astronaut transfer vehicle to be used after lunar landing. Finally, Apollo 10, a lunar orbit flight, with descent to within 50,000 feet of the lunar surface.

The follow on flights and lunar landings of Apollo 12, 13, 14, 15, 16 and 17 extended our exploration of the lunar surface. Only Apollo 13 was unable to complete the lunar mission due



Photo from the Chuck McKim Collection

DEACTIVATION/DECONTAMINATION (D/D) AND POST FLIGHT TEST TEAMS
Front Row: —#1—, — Shimuzu, Harry Morman, Bert Richards, Lino Salazar
2nd Row: Floyd Schmidt, Ossie Ried, Don Coleman, P.R. McCarley, —#2—, Jim Michaels
3rd Row: —#3—, Max Boggs, Mark Gordon, Bill Schmidt, Ben Bolger, Chuck McKim
4th Row: —#4—, —#5—, Jay White, —#6—, —#7—, Dick Brundin
Editor's Note: All names are left to right. Neither Jay nor Chuck could recall the names of the team members identified by the numbers. Can any of our readers come up with the names to match the faces?

to failure of an oxygen tank in the Service Module during transition to the moon. With extraordinary improvisation by Mission Control in Houston and outstanding adaptability by the crew, the spacecraft made a successful return, landing and recovery.

While checkout of the Command and Service Modules was being conducted by Test and Operations personnel in Building 290 in Downey, other personnel were being trained for deactivation/decontamination (D/D) operations to be conducted on the spacecraft following recovery operations by the U.S. Navy. D/D operations on the early earth orbit flights were conducted at the naval facilities in Norfolk, VA. For the following lunar flights, the D/D operations were conducted at Ford Island and Hickam AFB in Honolulu and at the Naval Base in San Diego, CA.

Each of the two D/D teams was headed by a Team Leader and included an Electrical Engineer, RCS Engineer and three technicians. The team was further augmented by Quality Control, Engineering and NASA personnel. D/D team members were required to have passports, current physical examinations and inoculations for possible worldwide deployment, depending upon spacecraft landing area. The teams worked 12-hour shifts, normally completing the D/D operations in three days. The authors were both team leaders.

The console equipment was designed and manufactured by Engineering and Manufacturing-one console for the fuel system and one for the oxidizer system-including all hookup cables and fluid lines. Normal transport for the D/D team was by C-141 from Long Beach Airport along with drums of alcohol and freon, bottles of nitrogen and a wide variety of tools. We always looked forward to using the consumables stored in a couple of large boxes so that we would have room for fresh pineapples on the return trip from Hawaii.



NASA Photo

***President Richard Nixon welcomes the crew of Apollo 11, already confined inside the Mobile Quarantine Facility aboard the* USS Hornet.**

The D/D procedures required safing and removal of the remaining pyrotechnic devices and removal of remaining fuel and oxidizer from the RCS system and purging of those subsystems. Two basically identical consoles were used, one for each subsystem. The procedures required removal of numerous access panels on the spacecraft and installation of electric cables and fluid lines for the RCS system. All of the procedures were developed by RCS Engineering, Electrical Engineering and Test personnel and were documented and certified by Quality Control and NASA personnel.

Apollo 11 and 12 were handled differently since they were the first lunar landing flights. The astronauts were transferred directly to the Mobile Quarantine Facility and flown to Houston to a sterilization facility there. The spacecraft was run through the D/D procedure in Hawaii but the hatch remained closed there. The spacecraft was then flown to Houston and placed in an isolated area for sterilization of the interior of the CM by the D/D team.

When the CM arrived in Houston, it was necessary to transfer it from the shipping trailer to the work trailer for operations in the sterilization facility. The Houston ground crew discussed how they were going to get the crane hook in the lifting eye atop the spacecraft for over thirty minutes. A bit disgusted with all the delay, we asked PR McCarley to get it done. He shinnied up the side of the CM and with one foot in the rendezvous window, he signaled the crane operator for the hook. Five minutes later, the CM was on the trailer and ready to roll into the facility.

Of course, about two hours later we got a call from Labor Relations in Downey which we settled for a few hours of overtime. Once in the facility, the CM was pressurized with basically embalming fluid, let set for two days and then ventilated. No problems were ever encountered with lunar contamination.

Following completion of the lunar flights, the program shifted to the Skylab program. The mission was designed to place the laboratory in orbit and then to visit it with Apollo crews for extended periods of time to checkout the effects of long term space operations on crew and spacecraft. Missions were scheduled for as long as two months. Three flights were made to the laboratory by Apollo crews.

The program closed with a joint US/Russian flight termed Apollo/Soyuz. The spacecraft was modified with special adapters to allow mating of the two space vehicles while in orbit. The Russian crew consisted of two cosmonauts and the American Apollo of the normal crew of three astronauts. With that, the Apollo program came to an end having completed four prelunar landing flights, six lunar landing flights, three Skylab flights and the one Apollo/Soyuz flight.

About the Authors: Chuck McKim joined NAA on the Navaho G-26 program, shifting later to the Hound Dog/B-52 test team. He subsequently joined Apollo Test & Operations where he helped develop the Deactivation/Decontamination teams. He retired in 1975 after completion of the Apollo/Soyuz mission. Chuck resides with his wife of 63 years, Mildred, in Clifton, CO.

Jay White completed his assignment on the Apollo program on the Apollo/Soyuz. He transferred to Test & Operations on the Shuttle program in Palmdale. He retired in 1978 and he is currently living in Gardnerville, NV with his wife of 62 years, Bea.

The Last Fury Flying

(continued from page 5)

During my first high-altitude flight, up to FL410, I noticed another unique handling quality. The aircraft accelerates quite rapidly when the nose is lowered even a slight degree; approaching Mach 0.85 to 0.88, the *Fury* develops a "Mach Tuck" and pitches down. At about the same time there is a slight pitch control reversal and aft stick produces more pitch down. I investigated this further and learned that it gets worse the longer you allow the plane to accelerate.

This characteristic is why the FJ-4B has a Mach trim system, which trims away the "Mach Tuck" and reversal problem in the transonic regime. Everyone I've spoken with who flew the FJ-4B describes the aircraft as a "Cadillac" of the Korean War fighters and I would agree although I have never flown the F-86 *Sabre*.

The *Fury* has enormous range, over 2,000 nm on internal fuel alone, which makes her an excellent cross-country aircraft with extensive baggage room in the ammunition bay. There are two large 24-volt and two 12-volt batteries where the 20 mm cannons were located—more than enough for self-starting. All of these factors make the aircraft an ideal airshow traveler.

Indeed, that is the plan—you can expect to see this immaculate and unique part of naval aviation appearing at a number of displays across North America. During the airshow season, qualified pilots will perform a unique formation involving aircraft that span 50+ years of military aviation history. A combination of the FJ-4B *Fury* and the F/A-18D *Hornet* will be one of the star attractions.

About the Author: Richard Sugden is a practicing physician in Jackson, Wyoming. His passion for flying began in his teens when he received his private pilot license and continued during his service in U.S. Navy Aviation as a Flight Surgeon at NATC Pax River. His restoration projects include a T-28 Trojan, Grumman Albatross, and T-2 Buckeye. He owns an N3N "Yellow Peril", T-34 Mentor, and an SNJ-6 Texan. He hopes to one day own each of the U.S. Navy training aircraft. Dr. Sugden invites any of our readers that have historical information or interesting stories about the FJ series to contact him by e-mail or mail to rsugden@wyoming.com or Rich Sugden M.D., P.O. Box 2468, Jackson, WY 83001.

Photos for this article were generously provided by noted aviation writer and photographer Tyson Rininger of TVR Photography in Monterey, CA.



Photo Courtesy of Tyson Rininger

Dr. Richard Sugden checks out the last Fury flying at Teton Aviation Center in Driggs, ID.



The 25th Annual Grants Pass Picnic was held at Indian Mary Park in Oregon on September 8, 2004. Among those attending (l to r) were Walt Jones, Gloria Farquhar, George Heyworth, Forrey White, Helen Snider, Gerald McGee, Bill Snider, Howard Nelson, Bob Morse (kneeling), Earl Preshaw, Joan Ives, Virginia Preshaw, Edette Price, Chuck Adams, Milo Price, Esther Weddle (kneeling), Bev Leonard, Gil Judson, Ralph Leonard, Bill Francis, Ida Francis, Bill Stinson, Margaret Stinson, Linda Morse, Gloria Cragin, Neel Weddle, Bob Cragin, Elizabeth Catuto (kneeling), Al Catuto, Gail Catuto and Ed Catuto.

Contrails From The Past

By Ed Rusinek

Dear Ed,

The B-1 article, Winter 2004 Issue, contained some allusions in dealing with the team effort from proposal submittal in 1970 to signing of the production contract in 1982 which I would like to clarify. The B-1 team achievements during that time were far above and beyond simple dedication and reflect the following legacy:

1. Creation of "a superb flying machine" to be the production starting point.
2. A flight test achievement of 1,700+ hours without an accident.
3. Award of the NASA Collier Trophy in recognition of B-1 team performance.
4. Survival through a severe financial crunch, 1977-1982.

All of these efforts were confirmed by the contracts signed in 1982. To name any, or all, of the people involved would be an honor roll of team achievement and dedication. Indeed, a "Proud B-1 Team Legacy" for all who followed. Many of the people on the honor roll are now members of the "Silent Majority".

In their memory, I vigorously support the position that their efforts be included in any "Proud Legacy". They and those still living, rightfully, should take their place alongside both the Outstanding Proposal Team and the Outstanding Production Team.

It is my sincere expectation that those who continue on the B-1B will equal, or better, the achievements of those they are following.

—Hal Raiklen, Long Beach, CA

Ed's Resp.:We all recognize the efforts and achievements of so many, from president to janitor, who proudly wore the badges of North American Aviation including you, Hal. The B-1 team had the legacy of those that designed and built the many "superb flying machines" that came before them. Much of what you mention about the B-1 was told by Bastian "Buz" Hello in his article "How The Best Was Won" in the Fall 2001 Issue of the NAA Retirees Bulletin. Unfortunately, all that we were is now confined to a few history books and even those shall pass!



The North American Flying Horsemen held their 20th annual reunion on September 15-17, 2004 at the home of Tony and Marilyn Mociun in North San Juan, CA. The group is very committed to HOPE Ranch, a non-profit organization helping the disabled to gain self esteem through horse therapy.

The Silent Majority

by Stan Guzy

ALBERTSON, FRANK E., 70 – of Orange, CA died on January 19, 2005 of lung disease. Frank was an aerospace marketing manger at Autonetics prior to his retirement. His wife Jeanne survives him.

ANDERSON, KEITH V., 81 – of Laguna Niguel, CA died of metastatic mesothelioma on November 18, 2004. He worked at Autonetics as an aeronautical engineer for many years. His wife Maurine Beatrice survives him.

ATTAWAY, FRED J., 72 – passed away on December 2, 2004 in Fullerton, CA from pulmonary difficulties. Fred served for 22 years in Test & Operations on the Apollo program at KSC, and as manager of Shuttle System Safety and supervisor in Shuttle Mission Control in Downey. He retired in 1983. Prior to joining NAA, Fred was a pilot in the U.S. Marine Corps. His caring wife Audrey survives him.

BEEMAN, RAYMOND, 80 – of Torrance, CA, passed away at home on December 6, 2004 from complications of Parkinson's disease. Ray retired in 1989 from the aerodynamics group at LAD with 35 years of service. He is survived by his devoted wife of 54 years, Pearl.

BIRGEN, DOMINIC F., 85 – died on January 19, 2005 of undisclosed causes. He retired from RI as a corporate tax manager after many years of service. His wife and extended family survive him.

BLACKFORD, JOAN T., 63 – of Laguna Beach, CA died on January 24, 2005 of cancer. She worked as a production manager for NAA/RI/Boeing.

BONEM, ERIC J., 78 – died November 19, 2004 of undisclosed causes in Fountain Valley, CA. Eric had a long career as an aerospace engineer at Autonetics. His wife preceded him in death.

BROFMAN, WOODY, 69 – of Anaheim, CA died on December 23, 2004 from complications of pneumonia. He had been an aerospace engineer for NAA/RI

CLODIUS, RICHARD T., 75 – died on November 24, 2004 of congestive heart failure in Anaheim, CA. Prior to retirement he had worked at Autonetics in the engineering disciplines. His wife Vera survives him.

COLE JR., DONALD M., 87 – of La Habra, CA died of arterial fibrillation on January 24, 2005. He had worked in the engineering department at NAA/RI prior to retirement. His wife Betty survives him.

COOK, ARTHUR W., 79 – passed away peacefully from cancer at his home on December 6, 2004. He was in electronics engineering at the B-1B Division. He retired in 1985 after 32 years of dedicated service. Rosalind, his loving wife of 14 years, survives him.

DOHL, FRED R., 75 – lost a long battle with cancer on January 1, 2005 in Santa Maria, CA. Fred retired from Satellite Systems Division in 1988 after 29 years of service. He served at White Sands Missile Range, Kennedy Space Center and Vandenburg AFB before completing his career at the Seal Beach facility. His wife Eileen survives him.

D'URSO, DANIEL L., 86 – passed away peacefully at his home in San Clemente, CA on January 9, 2005. After serving as a naval aviator he joined Autonetics as a Project Manager and served in that capacity for many years. His wife Julie survives him.

GERMAN, SAMUEL E., 86 – passed away in Riverside, CA on November 11, 2004. Earl was a metalworker at LAD when he retired after 37 years of service. He suffered a stroke and was in nursing care for two years. His loving wife Dorothy survives him.

GLIDDEN, TERRY L., 64 – of Anaheim, CA died on December 9, 2004 of unspecified causes. He had worked as a blue print operator at NAA/RI for many years prior to retirement.

HARTBERGER, HELEN R., 81 – passed away on December 5, 2004 at the Fairfield Medical Center in Lancaster, OH when her heart gave out after successful surgery. Helen retired to Thornville, OH in 1986 after 27 years of service at the Columbus Division.

LEFLER, DOUGLAS C., 81 – passed away in Santa Cruz, CA on January 22, 2005, after a brief illness, due to congestive heart failure. He joined NAA in 1953 and was responsible for pricing and contracts on various projects including the X-15, XB-70 and the B-1. He retired in 1983 and is survived by his loving wife Judy.

MASSEY, JOHN L., 89 – died on August 12, 2004 in Sun City, CA. John had worked as a department manager in manufacturing at NAA Los Angeles Division for many years prior to retirement.

McCRAE, WILLIAM N. "BILL", 90 – passed away in Berryville, VA of a heart condition on November 14, 2004. Bill retired in 1979 as a subcontractor administrator with over 24 years of service in the material division at Rocketdyne. His wife Margie survives him.

McKECHNIE, ROBERT S., 76 – of Temecula, CA, died December 16, 2004 at his home. Robert retired from Rockwell after 35 years of service as an engineer. He is survived by his loving wife of 53 years, Gayle.

MEADOWS, TERRY, 75 – died on September 29, 2004 at Marian Medical Center in Santa Maria, CA after suffering a stroke. He worked at the LA Division for many years and was instrumental in the early developmental phases leading up to the award of the initial B-1 contract. Janet F. Stahl, his companion of 23 years, survives him.

MONTOYA, NARCISO "CISO", 86 – died peacefully on December 4, 2004 after a long battle with Parkinson's disease. He had retired from NAA/RI and was a published poet. He is survived by his loving wife of 54 years, Carmen.

OWEN, MARIANNA, 80 – residing in Mission Viejo, CA died January 24, 2005 as a result of a stroke. She had worked as a secretary at the NAA LA Division for twenty years before retiring in 1980. No further information available.

PALMER, RICHARD R., 77 – died of congestive heart failure on December 14, 2004 in Placentia, CA. He was a retired NAA/RI aerospace engineer. His wife Betty survives him.

POLING, CECIL D., 90 – of Buena Park, CA died of chronic obstructive pulmonary disease on January 1, 2005. Cecil retired from NAA/RI after many years of service as a quality assurance engineer.

RIVAL, ISABEL C., 74 – died on December 14, 2003 at home in Norwalk, CA of pancreatic cancer. She retired as a lead person from the Autonetics machine shop in 2002 after 35 years of service. Her granddaughter Arleen Rival survives her.

SAURO, JOSEPH, 79 – passed away on December 2, 2004 in Mission Viejo, CA. Joe was an in-plant truck driver between Anaheim and Palmdale for many years. He retired in 1987 after 35 years of service.

SKINNER, LOREN R., 86 – passed away quietly on November 14, 2004 at his home in Escondido, CA. Loren joined NAA at the Kansas City plant in the early 1940s before going into the U.S.Army. He returned to LAD where he joined the renowned Tooling Group and was a key member of the Master Tool Design Group and later, the Manufacturing Engineering Advanced Programming Group. He was part of the cadre of specialists chosen to launch the Tulsa Division in the 1960s but returned to LAD on the B-1 program. He retired in 1980 after 36 years of service.

STUBBAN, SCOTT, 70 – of Santa Ana, CA, a retired systems manager from Rockwell, died on December 17, 2004 of a stroke. He is survived by his loving wife Roni.

SWARTZ, RITA M., 76 – of Laguna Woods, CA died of cancer on December 6, 2004. She had worked at NAA/RI/Boeing as an executive secretary prior to retirement.

TAGGART, EDWIN E., – of Redondo Beach, CA retired from Space Division in 1985 after 34 years of service. Bulletin returned stamped "Deceased".

TRACE, JONDA L., – of Columbus, OH retired from the Columbus Division in 1989 after 29 years of service. Bulletin returned stamped "Deceased".

TUCKER, WILFORD E. "WILL", 79 – died in Klamath Falls, OR of cancer on December 3, 2004. Will retired from Autonetics Defense Systems in 1983 after 28 years of service. He is survived by his loving wife Tina.

VARTANIAN, SARKIS V., 75 – died in Torrance, CA on January 26, 2005 of a heart attack after spending months in a hospital as a result of an accident. Sarkis retired in 1991 from the B-1 Division after 36 years of service in Material Control. He is survived by his loving wife Jane.

WILLIMAN, ALEXANDER O., 75 – died at his home in Escondido, CA on January 25, 2005 after a long and courageous bout with leukemia. Alex began his career at NAA/Downey in 1952 and retired from Autonetics in 1987. He was an accomplished computer system designer and engineering manager in Data Systems and Microelectronic Research Division for many years. He was Director of Engineering, Strategic Defense & Electro-Optical Systems Division at the time of his retirement. Louise, his wife of over 54 years, survives him.

EDITOR'S NOTE:
I request obituary information on the following retirees so that their passing can be properly honored in the Silent Majority: Joyce De'Angelis *and* Robert Butler. *Please send all replies to the NAAR Bulletin office. Your assistance would be greatly appreciated. — Stan*



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Photo courtesy of the Boeing History Archives Office

The OV-10A, Aircraft No. BuAer 155467, was one of a group of 223 delivered by the Columbus Division, 114 to the USMC and 109 to the USAF. The Bronco performed observation, forward air control, helicopter escort, armed reconnaissance, gunfire spotting, utility light air transport and limited ground attack. The Bronco has also performed aerial radiological reconnaissance, tactical air observation, artillery and naval gunfire spotting and airborne control of tactical air support operations, and front line, low level aerial photography.

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION Retirees Bulletin

Summer 2005

Inside: **P-38 RESCUE IN ROMANIA** by Richard Willsie and Richard Andrews
THAT DAY OVER THE YALU by James Brooks
BALD EAGLES 43RD ANNUAL REUNION by Lee French



Photo courtesy of Sabre Jet Classics
To stem the flow of oncoming North Korean forces into South Korea, a small number of F-86As were sent to the airfield K-13, Suwon Air Base. A group is being readied for a sortie over MiG Alley in of Summer 1951. The black and white chevrons on the wing tips and fuselage were added to provide easier identification from the MiG-l5s which had a similar appearing profile.

NORTH AMERICAN AVIATION
Retirees Bulletin

NAAR BULLETIN, an affiliate of the **Bald Eagles, Inc.**, is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

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DEAR NAA RETIREE BULLETIN SUBSCRIBER

Our Spring 2005 Issue was well received by the retirees from Columbus but we hardly heard a whimper from the rest of you! In this issue we have a pair of exciting stories that we think you will enjoy. Our terrific P-51 fighter pilot, Jim Brooks, who previously told us of his long mission from Italy to Poland to destroy American planes recovered by the Germans; now talks about the first encounter of the F-86s with the MiG-15s over the Yalu River in North Korea.

We also bring you the final segment of what has become a trilogy. First, we had the story of the American Airmen Memorial in Poland with a concrete full-scale B-17. We followed it up with the story of the crew of the B-17 that was commemorated by the memorial. Now, recall that when the B-17 crew arrived at Poltava, Russia, a P-38 came straight in with two men aboard. One had been shot down over Romania and the other landed and picked him up! Their story has nothing to do with North American Aviation but it is a truly great American story and we are very proud to bring it to you. To give you a better feel of the intensity of the event, we use the actual words of the two pilots: *the rescuee's words* are in **bold print** and the *rescuer's words* are in ***bold italic print***.

The turnout for the Bald Eagles 43rd Reunion was well attended although some well known faces were not there. Only two of the original charter members from Dundalk, MD were present, Ralph Ruud and Al Purcell. Chan King passed away just the week before. Two of our test pilots, LAD Jim Brooks and Columbus Division Arch Lane, were in attendance. The guest speaker, Howard Chambers, provided an outstanding and crisp presentation on Boeing programs, currently in progress and those sought in the future.



The volunteer staff of the NAAR Bulletin at the Bald Eagles 43rd Annual Reunion: Ed Rusinek, Bryan Hori, Sonnie Robertson and Stan Guzy

THE 3RD B-1B REUNION LUNCHEON WILL BE HELD ON SATURDAY, SEPTEMBER 24, 2005 AT THE GOLDEN SAILS HOTEL 6285 EAST PACIFIC COAST HIGHWAY LONG BEACH, CALIFORNIA 90803

MARINA BALLROOM

SOCIAL HOUR 11:00 AM * SEATING FOR LUNCH AT NOON * PROGRAM TIL 4:00 PM

SEND YOUR CHECK FOR $15 PAYABLE TO LEE FRENCH

SOCIAL CONTACTS ARE:

LEE FRENCH (562) 866-9435

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Make Reservations Now!

No tickets will be sold at the door!

NAA/ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Frank Zelinski at (562) 866-3195.

The Antelope Valley Retirees Club meets in the South Meeting Room of the Palmdale Culture Center at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell/Boeing retirees are welcome. For information, contact Bill "Tiny" Kistler at (661) 273-0213.

Boeing Valley Retirees Club meets on the 3rd Thursday of each month at the Canoga Park Rec Center, 8500 Fallbrook Avenue, Canoga Park, CA. The president is Duane Buckley at (818) 881-2655.

Boeing Valley Retirees Club also meets on the 1st Wednesday of each month at 8:00 AM for breakfast at IHOP Restaurant, corner Fallbrook and Vanowen in West Hills. Contact Howard Seese at (818) 344-7861.

"The Old LAD Stress Group" meets for breakfast approximately every two months at Mimi's Café in Torrance, CA. If you are from the old LAD Stress Group contact Gene Laxton at (310) 378-3113 or Ed Rosenthal at (310) 375-8933.

"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meet at 11:30 AM on the 2nd Wednesday of the month for lunch at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd and Mariposa Ave.

The NAA 101 Tooling Retirees Group meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at Billy's Restaurant, 5160 190th St., west of Anza Avenue in Torrance, CA.

GPS Breakfast Club meets from 6:00 AM to 8:00 AM every Wednesday at the Primrose Restaurant, corner Seal Beach Blvd. and Westminster Blvd. All are invited. For more information, call Fred Shitara at (714) 750-1016.

Seal Beach Retirees Group meets at 11:30 AM on the 3rd Wednesday of the month at "The Fish Co". on Los Alamitos Blvd. at Katella Avenue. For more information call Marvin Blaski at (714) 848-5717 or e-mail to *mblaski@aol.com*.

The Facilities, Industrial Engineering and Plant Services Retirees Group meets at 11:45 AM on the 2nd Thursday of each month at Buster's (formerly Jolly Rogers) Restaurant in the Long Beach Marina. Contact Joe W. Mausser at (562) 596-5845.

"Ye Olde Pharts Breakfast Club" meets at 10:00 AM on the 4th Thursday each month for breakfast at Polly's Pies at 2025 N. Tustin Avenue in Orange. For information call Don Metzger at (949) 495-5374.

The North American Rockwell Retiree Club of McAlester, OK (a satellite of Tulsa, OK) meets at 10:30 AM on the 3rd Tuesday in March, June, September and December at the Down Town Meeting Place. Call J.A. Darden at (918) 423-0706 for more information.

Tulsa & McAlester Retirees meet for breakfast at 8:00 AM on the 2nd Monday in March, June, September and December at the Ramada Inn, 8181 East Skelly Drive in Tulsa, OK. Call Harry Phillips at (918) 838-3716.

The North American Rockwell Retirees Group of Columbus, OH Engineers and professionals meet at 11:30 AM on the 3rd Thursday of each month at the Berwick Park House. Contact Byron C. Solomides at (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH meets at Noon on the 1st Monday of the month at the Whitehall Community Park on North Hamilton Road in Whitehall. Contact E. Hamilton at (740) 927-5940 for information.

Autonetics Group including Marine Systems, Program Office, Project Office, System Test, Engineers and Designers meets for lunch on the last Wednesday of each month at the HomeTown Buffet, Rose Avenue and Alta Vista Drive in Placentia, CA. Call Mike Vohs at (714) 762-1925 for more details.

Autonetics Industrial Engineering and Maintenance Retirees meet for lunch on the 1st Thursday of each month at the HomeTown Buffet, 390 McKinley, located in front of the Home Depot, in Corona, CA. For more details, call Don Burk at (909) 698-0072.

Autonetics Flight Control Retirees meet at 11:30 AM on the 3rd Thursday of each month except in December at The Lamppost Pizza House located at 17568 Yorba Linda Blvd., corner of Richfield Road, in Yorba Linda, CA. Call Jim Anderson at (714) 779-5620 for details.

Autonetics Retirees meet for lunch at 11:45 AM on the 2nd Wednesday of every month at the Rembrandt Restaurant or Yorba Linda Country Club. All Autonetics retirees, spouses and friends are invited. Contact Robert Nease at (714) 516-1844 or e-mail to *rfnease@email.msn.com* or Ed Venanzi at (714) 779-5652 or e-mail to *EdVennz@aol.com*.

A Group of NAA Retirees meets for breakfast at 8:15 AM on the 1st Wednesday of each month at Knott's Berry Farm-Chicken Restaurant. All are cordially invited. Contact Maxine Haun at *maxi3131@sbcglobal.net*.

Autonetics Financial Luncheon Group meets for lunch at Noon on the last Wednesday of the month at Marie Callendars, 126 East Yorba Linda Boulevard in Placentia. Contact Ken Cantwell at (714) 970-7171 or e-mail *Kcantwell@adelphia.net*.

A Group of Engineering Mgt. meets at 11:30 AM on the 3rd Tuesday of the month for lunch at Denny's on Imperial Hwy. and the 57 Fwy. Call Ed Moran at (562) 697-9949 for information.

NAA Tech Reps Assn. (TRA) Breakfast Club meets at 9:00 AM on the 1st Tuesday of each month at the Carlsbad Airport Restaurant. For more information, call El Presidente Rafael Colunga at (760) 940-0525.

Material Group retirees from Downey and Seal Beach meet at 11:30 AM on the 4th Wednesday of every month at the Stox Restaurant at Imperial Hwy. and Bellflower Blvd. in Downey. Contact Marian Nielson at (562) 429-1020 or Joan Dominguez at (562) 865-7200 or e-mail to *tatedom@aol.com* for information.

Rockwell Vandenberg AFB Retirees Breakfast Club meets at 8:45 AM on the 2nd Tuesday of each month at the IHOP Restaurant in Santa Maria. Contact Marv Bailey at (805) 929-6552 or Al Finlay at (805) 937-3690.

ANNUAL EVENT

Bald Eagle 43rd Annual Reunion – will be held on Saturday, April 16, 2005 at the Proud Bird Restaurant. Call Val Yarbrough at (805) 646-2283.

The Hangar Gang B meets at the Proud Bird approximately every 4 months. For time, date and other details, call Gene Salvay at (818) 788-3974 or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

Flight Test Instrumentation Annual Reunion – meets annually at the Fullerton Elks Club. For information, call Frank Vigil at (562) 691-0236.

Tech Rep Association Picnic – A group of retired Field Service Technical Representatives has a yearly picnic in June at a park in Fallbrook, CA. For more information, call TRA President Rafael Colunga at (760) 940-0525 or e-mail to *rafael@nctimes.net*.

The Annual M&P, P.D.L., "Friends Christmas Luncheon" – This group of retirees and employees have assembled in mid-December for a festive luncheon and gabfest for the past 20 years. Those wishing to participate and receive notice of the next December luncheon, call Fred Koeller at (310) 545-8854.

NAA-K B-25 Reunion will be held on Sunday, August 21, 2005 from 1:00 PM to 5:00 PM at the Wyandotte County Museum in Bonner Springs, KS. For more information, call Harry J. Desko at (913) 287-7223 or write to him at 3024 N. 47th St., Kansas City, KS 66104.

Grants Pass NAA/RI Retirees Picnic will be held on Wednesday, September 7, 2005. Contact Bob Morse for details at (541) 474-1438 or e-mail to *lindabob2@earthlink.net*.

NAA Flying Horsemen will hold their annual reunion on Friday through Sunday, September 9 through 11, 2005 at the Bob Morse's home in Grants Pass, OR. Contact Bob Morse for details at (541) 474-1438 or e-mail to *lindabob2@earthlink.net*.

P-38 Rescue In Romania

by Richard Willsie *and Richard Andrews*

In the Winter 2004 Issue of the NAARB, the story of the rescue of the B-17 crew in Poland mentioned that their arrival at Poltava, Russia was interrupted by the sudden arrival of a P-38 carrying two men. One had been shot down over Romania and was rescued by the other. They were recognized by another former P-38 pilot and our friend Joe Onesty. Through him, we found these two heroes and, sixty years later, asked them to tell us what happened. It has nothing to do with North American Aviation but a lot to do with being American. We are so very proud of them! Here is their story...

In 1944, the 15th Air Force located in Italy was engaged in Operation FRANTIC, a series of shuttle missions to and from Russian air bases. The purpose was to attack targets in Axis controlled Eastern Europe which were normally beyond the range of both the 8th and 15th Air Forces. The Germans had moved some of their war industries to that area to escape the round-the-clock bombing by the RAF and USAAF.

The specific targets of FRANTIC 4 were airfields in Romania. These were also to be diversionary attacks which would draw off enemy fighters from other 15th Air Force targets in Romania and the Balkans. This all-fighter shuttle mission consisted of forty-five P-38s from the 82nd Fighter Group.

The 82nd pilots were airborne at 8:00 AM on August 4th to strafe the two airfields at Focsani in Romania located 70 miles northeast of Ploesti. Enemy fighters were based there to defend the oilfields at Ploesti. As the group began to lose altitude north of Ploesti, it encountered heavy anti-aircraft fire. The pilots began strafing trains on the many railroads in the area.

Lt. Willsie, leading blue flight of the 96th Fighter Squadron, lost his right engine to flak. Even though he was on single engine, he went ahead and strafed one of the airfields. As he completed his run, his good engine was knocked out by AA fire.

I noticed coolant streaming from my right engine cooler located aft on the boom. This meant I only had few minutes left, at best. I then made a call and reported my plight, and that I was going down. A response came from Flight Officer Dick Andrews, ***Pick a good field and I will come in after you.***

Andrews had exhausted his ammunition on the trains and trucks in the marshalling yards when he saw Willsie on single engine and flew up on his left wing. ***I could see that it wouldn't be long before his right engine went out because all his coolant was flowing out.***

I had to get down quickly if I wanted to have any control of the landing. I forgot about everything else and concentrated on putting the plane down. Suddenly, my windshield cracked from another hit. I felt a sting on my head and then a warm trickle down my forehead.

I saw a place to land and two quick turns and a sideslip put me in position over some trees and down. I was flying Major Isaacson's P-38 because he was on leave and my plane was down for maintenance. He was big and his plane was modified to accommodate his huge frame. The shoulder harness was not adjustable and the seat was set down and back. I had to use an extra cushion to fit in properly.

I had also noticed before I took off that day that when I leaned forward my head came to rest on the gun sight. The gun sight had a piece of sponge rubber taped on it. Should your shoulder harness break during a crash landing, the cushioning effect would supposedly protect your head somewhat.

As I slid over the last obstacle and touched down-I placed my head against the rubber on the gun sight-and before the plane skidded to a stop my nose felt like Joe Louis had broken it with several of his left jabs and right hooks! I put my hand up to my face and it came back with thick blood all over it. I felt sick.

But I could still move, and move I did! I jumped out on the left wing and grabbed a small phosphorous bomb out of the cockpit. Our orders were to destroy our aircraft if we were shot down, and this bomb did the trick.

The bomb was a little larger than a Dutch Cleanser can. You removed the cardboard cover and revealed a metal canister with a ring attached that you pulled to make it go off a few seconds later. I placed the bomb on the wing just above a fuel tank and pulled the ring. I could hear planes overhead and saw some P-38s and Me109s dogfighting. I also saw men in the distance and trucks not far off. I heard rifle fire and the whine of bullets. I headed down the left wing, which was against the ground, and turned to run for cover of the nearby trees.

At this time I saw Andrew's plane with its landing gear down. Spellbound, I dropped down and watched it. I thought, "My God, he is coming in to pick me up!" The field was soft and had obviously been planted recently, as there was stubble about an inch high. I had on sheepskin flying boots-not the best running gear—but I ran hard anyway, what seemed like the length of a football field toward his plane...When he finally stopped, he started to taxi in my direction, but someone called him on the radio and said to stay there, because I was coming to him.

I watched Willsie land across furrows, then I made a 180° turn, putting my gear and flaps down. Seeing I was too close to the field, I picked my gear up, made a 270° turn and started my approach, putting my gear back down when I saw I could make the field. I landed with the furrows, making sure to make a smooth landing...I stopped short 100 feet from a cornfield...pulled my flaps and set them in takeoff position. Leaving the engines running at 1800 RPM; I locked the brakes, opened the canopy, climbed out on the wing, discarded my parachute and threw it on the ground.

At this time, there were six Me109s ducking in and out of the clouds, waiting for the chance to come down and strafe us. Three poor fools tried. One was shot down and the other two were damaged before they got halfway to us. Some of the P-38s also strafed the trucks and soldiers that were closing in on the two pilots on the ground.

When I got to Dick's P-38, he was standing on the wing. He had lowered the fold-down ladder and thrown his

chute away. Although out of breath, I managed a big smile. He grabbed my hand and pulled me up on the wing. Five words passed between us, *You okay?* Yeah! *You fly!* We both jumped into the cockpit with a miracle of precision. I sat as far forward as I could, with him behind, me not really on his lap and he not on my back with his legs straddling me. My hind end was on the front part of the bucket seat.

We pulled the canopy closed. Dick put up the right window and I put up the left. This all occurred within seconds. I then pushed the propeller control to low pitch, pulled back on the controls to keep the nose up, and eased the throttles forward. I felt the nose wheel dig into the soft earth of the plowed meadow when I let go of the brakes. I couldn't get the control wheel back any further, so I cranked in full trim—nose up! It did come up and we started rolling. There were trees ahead of us, so I put down the flaps to combat position, which helped us lift off. Now I had to play the climb just enough to clear the trees-not too much or we would mush right into them. We did clear those trees, but I sure was glad they weren't ten feet taller! I kept the P-38 on the deck and looked for our friends.

From the time my aircraft touched down and Willsie got us airborne, no more than three minutes had elapsed. In our excitement we forgot to pull up our gear, til someone called over the radio fifteen minutes after our takeoff. Al Campbell and Leslie Loehr then picked up a weave pattern over us to cover us from attack. While Campbell stayed for our protection, Loehr left to cover others flying on single engine.

No ammunition left; we could fly, but never dogfight, never. I was still bleeding. Dick thought I must be in pain, so he got out his first aid kit and searched for the morphine syringe. He said, *"I'll give you this in your arm, it will cut down your pain".* I said frantically, "No, no. I'm all right; just let me see your maps".



Photo from the Dick Andrews Collection

Less than three minutes had elapsed from the moment Flight Officer Richard Andrews' P-38 came to a stop until brake release for takeoff with 1st Lt. Richard Willsie at the controls.



Photo from the Dick Andrews Collection

The following day at Poltava; when asked to demonstrate how they sat in the cockpit, the two men struggled for thirty minutes but could not reenact their contorted positions for photographers.

Andrews found eight maps in his escape and evasion kit, but none of Russia! Although Willsie did not want any morphine, Andrews did swab his cuts with iodine. Willsie later recalled thinking, **Andrews had just turned 20 and it was only his 10th mission with less than 100 hours in the P-38. He was getting experience fast!**

At this time, we diverted our attention to the ground. We had to cross both the German and the Russian lines. The Russians were not that good at aircraft recognition. Fortunately, the weather closed in, with heavy rains, a very low ceiling and poor visibility. I had been in Russia two weeks before, so I was familiar with the route and the terrain. I told Dick we'd stay on the deck. I would lean my head on the instrument cowling and fly by instruments while he flew by observing the ground. We would fly on course until we reached the Dnieper River, then we would fly up the river to checkpoints that I could recognize.

We didn't talk much on the way except for a warning now and then from Dick that we were approaching a hill and needed a little more altitude. Two and half hours later we spotted Poltava.

We kept our spirits up by joking about it all and kidding each other...My right leg went numb once and I straightened it out by putting it over his shoulder and the steering column and against the instrument panel. I imagine we were a mighty funny sight: two men in a cockpit built for one, tied up like a pretzel. During our flight, Campbell stayed with us all the time except once, when he got lost in the rain. We landed at the Russian airbase ahead of the other planes, due to Willsie's expert piloting...Those crew chiefs really flipped when they saw both of us climbing out of the P-38!

Alfred Lea, the navigator and the other crew members of the B-17 *"BTO in the ETO"* had just been dumped on the airstrip at

P-38 Rescue In Romania

(continued on page 9)

That Day Over The Yalu

by James L. Brooks

About the Author: Readers will recall the splendid report Jim gave us in the Fall 2004 Issue of his long distance P-51 combat mission from Italy to Mielec, Poland via Russia and back. In this issue, he describes the first all jet air battle between 12 MiGs and four F-86 Sabres. He is the epitome of the fighter pilot. Nothing more need be said!



Photo courtesy of Sabre Jet Classics

The author, Jim Brooks, pauses between missions at K-13 Suwon AB, Korea in 1951.

At 4:00 AM on Sunday, 25 June 1950, North Korea struck in great strength south across the 38th parallel.

On 27 June 1950, the United Nations Security Council met and concluded that "urgent military measures are required to restore international peace and security" and recommended "that the members of the United Nations furnish such assistance to the Republic of Korea as may be necessary to repel the attack."

This "police action" came to an end three years, one month and two days later on 27 July 1953 at Panmunjon.

As the North Koreans powered their way across the 38th parallel, the 4th Fighter Group was standing down at Langley AFB as a result of several weeks on Operation Swarmer in North Carolina. However, the North Koreans showed little concern for our well-earned rest and I found myself in the wee hours strapped in my F-86, awaiting orders to scramble and wondering if the North Koreans were as tough as the local mosquitoes. This folly would soon end, however, for the Wing would deploy to Newcastle, Delaware, and Andrews AFB and become a part of the air defense under operational control of the 26th Air Division.

THURSDAY, 6 NOVEMBER 1950 (AP)
NEW YORK TIMES

JOHN J. MUCCION, UNITED STATES AMBASSADOR TO KOREA, TOLD THE UNITED NATIONS INTERIM COMMITTEE ON KOREA YESTERDAY THAT HE BELIEVED THE FIGHTING WOULD BE OVER IN A FEW DAYS...

TOKYO, WEDNESDAY, 1 NOVEMBER 1950 (AP)
ISSUED BY GEN. DOUGLAS MACARTHUR'S HQ

A FLIGHT OF F-51S WAS ATTACKED EARLY IN THE AFTERNOON BY SIX TO NINE JET AIRCRAFT WHICH FLEW ACROSS THE YALU RIVER FROM MANCHURIA. NO DAMAGE TO U.S. AIRCRAFT. A RED STAR WAS OBSERVED ON TOP OF THE RIGHT WING OF ONE OF THE JET AIRCRAFT.

HEADQUARTERS
4TH FIGHTER INTERCEPTOR WING
NEW CASTLE COUNTY AIRPORT
WILMINGTON, DELAWARE
OT 370 11 NOVEMBER 1950
SUBJECT: MOVEMENT ORDER
TO: SEE DISTRIBUTION

IN ACCORDANCE WITH PROVISIONS OF WARNING ORDER, HQ EASTERN AIR DEFENSE FORCE, DATED 9 NOVEMBER 1950, AND OPERATIONS ORDER SERIAL NUMBER 28-50, HQ CONTINENTAL AIR COMMAND, DATED 10 NOVEMBER 1950, THE FOLLOWING NAMED UNITS AT THE APPROXIMATE PERSONNEL STRENGTH INDICATED WILL PROCEED FROM STATIONS INDICATED TO A THEATER OF OPERATIONS IN A TEMPERATE CLIMATE FOR AN INDEFINITE PERIOD OF TDY. PROVISIONS OF AFR 75-37 "PREPARATION FOR OVERSEAS MOVEMENT PQM" ARE WAIVED EXCEPT FOR IMMUNIZATION. UTILIZE A.P.O. #925, % P M SAN FRANCISCO, CA
BY ORDER OF COL. SMITH

At 0700, 11 November 1950, a gentle snow was falling on Andrews AFB, Maryland, temporary home of the 335th Fighter Squadron of the 4th Fighter Group. The Group was commanded by Lt. Col. John C. Meyer, a World War II ace, and was equipped with F-86A Sabre jets, a small but lethal swept-wing fighter designed and produced by North American Aviation. It was the Air Force's newest addition and the avant-garde of future jet fighter aircraft.

Because of the Korean hostilities, the 335th Fighter Squadron's assigned mission was the air defense of Washington, D.C., but events leading to a far more momentous undertaking were in

the making at Squadron Operations that November morning.

The first seasonal snow enriched scenes unfamiliar to those of us whose memories of World War II were still fresh. Young officers and their wives shared what might be their last fleeting moments together, as sixteen Sabre jets were being readied only a few yards away to race the sun westward.

I moved past the farewell scenes with an air of equanimity that seemed befitting for a bachelor fighter pilot. I had made my own goodbyes and cancelled my milk delivery at the same hour. However, for the moment, my thoughts were on the snowstorm, and I was silently wishing that there was an Air Force prayer for weather penetration aggravated by dissipation.

As we accelerated down the runway, "the tiffany of flight", snow flakes created an illusion of parallel lines as they hurled past our canopies, swirling behind our Sabres as if angry at being disturbed from their earthbound flight. Breaking into the clear at 20,000 feet, our destination was San Diego Naval Air Station. Operation "Straw Boss" had been launched!

The 4th Fighter Group, "The Eagles", whose distinguished history starting with the Eagle Squadrons in World War II and ending only when the Luftwaffe was no longer a threat, had received an invitation from the USSR's top aircraft designers, Mr. Mikoyan and Mr. Gurevich (whose joint initials were used to form the designation MiG), and they were eager to accept!

TOKYO, FRIDAY, 24 NOVEMBER 1950 (AP)
NEW YORK TIMES

GENERAL MACARTHUR AT THE FRONT WAS QUOTED BY THE ASSOCIATED PRESS AS SAYING, "I HOPE TO KEEP MY PROMISE TO THE GI'S TO HAVE THEM HOME BY CHRISTMAS"

A few days after Thanksgiving, the *USS Cape Esperance*, a World War II "jeep" carrier veteran of many South Pacific campaigns, cruised relatively unnoticed past Point Loma and out into the Pacific. Aboard were 49 F-86 Sabres and pilots-destination, Yokosuka, Japan.

As the *Cape Esperance* steamed unescorted through heavy winter seas on a course that took us north of the Hawaiian Islands and out of the normal shipping lanes, my thoughts returned to a cold January day far out in the Atlantic during World War II where thirty fighter pilots en route from Panama to North Africa could hear what sounded like depth charges. Our ship was positioned well within the convoy and there was no way to tell where and what the action was. Later, we were told that this was the largest convoy to cross the Atlantic and that four ships were lost to German U-Boats. However, the sanguine presence of the *Cape Esperance's* captain dispelled my fears that we were to be an attractive opportunity for a trigger-happy Russian sub from out of Vladivostok.

TOKYO, SUNDAY, 3 DECEMBER 1950 (AP)
RELEASE 694 ISSUED BY MACARTHUR'S HQ

SIX MIG JET AIRCRAFT MADE A SERIES OF DETERMINED ATTACKS ON A FORMATION OF B-29S EAST OF SINUIJI. AT LEAST ONE MIG WAS DAMAGED IN THE ENGAGEMENT WITH NO DAMAGE SUSTAINED BY ANY OF THE "SUPER FORTRESSES".

During our fourteen days en route to Japan, boredom was minimized by scheduling discussions to evaluate what little intelligence we had concerning the MiG-15. We knew the approximate thrust of the engine, which was a derivation of the British Rolls-Royce Nene that had been sold to the Russians after World War II. We also knew it had a swept wing of 38° compared to the Sabre's 35°.

The F-86A was a single-place, high altitude fighter designed for sonic and subsonic speed ranges at high altitude with a wing span of 37.1 feet, length 37.5 feet, gross take-off weight clean 14,250 lbs. And with two drop tanks 15,600 lbs. The powerplant was an axial flow, J47 GE engine having a rated thrust of 5,200 lbs.

It was generally agreed that the Sabre would have an edge over the MiG-15. But what about acceleration and maneuverability? These two most sought after features in the design of a fighter are the decisive factors in gaining air superiority in aerial combat. These unknowns could be answered only when we challenged the MiGs. My personal feelings were that our country's technology should be well ahead of that of the Russians with respect to the design and building of fighter aircraft. Historically, their reputation in this arena was rather dismal, if one could use World War II as a measuring stick. However, before that Christmas Eve, this satisfaction would become somewhat fleeting!

TOKYO, TUESDAY, 12 DECEMBER 1950 (AP)
NEW YORK TIMES

ENEMY JETS ENGAGED F-80S ON TWO OCCASIONS YESTERDAY. NO DAMAGE WAS SUFFERED BY EITHER SIDE. IN THE SECOND ENGAGEMENT, A MIG-15 WAS HEAVILY DAMAGED AND WAS LAST SEEN POURING SMOKE AS IT HEADED EARTHWARD. A SECOND MIG WAS PROBABLY DAMAGED.

NEW YORK TIMES, 19 DECEMBER 1950 (AP)

LT. COL. BRUCE H. HINTON, WHILE FLYING AN F-86 SABRE JET, SENT A RUSSIAN MADE MIG-15 FIGHTER TO THE GROUND IN FLAMES IN AN AIR BATTLE OVER NORTH KOREA.

Bruce, a top gun in the USAF, was the first to go north leading a flight of F-86s and, in turn, destroyed the first MiG-15. But, his first aerial victory had left some doubt about the F-86's four 50-caliber guns having the firepower necessary to destroy the more heavily stressed jet fighters over the World War II vintage. Bruce used 1,400 rounds of ammunition before the MiG went down. This observation would add a new dimension to future aerial combat—development of air to air missiles.

KIMPO (K-14), 21 DECEMBER 1950

K-14 was not a new type of K-rations but a code name for Seoul's municipal airport that had changed ownership three times in the past six months. What was left of the terminal would rival the ruins of Bastogne.

This apparent priority target was only a short distance from Group Operations and our living quarters, which consisted of World War II army tents placed in neat rows affording maxi-

mum kill probability for the enemy. This obviously never occurred to the Army Corps of Engineers.

At our first briefing, the army area commander hinted rather strongly that we should sleep lightly and close to our personal weapons, because Intelligence had reported a Chinese division of paratroopers somewhere north of the Yalu—their objective probably being K-14 and the F-86s.

When asked how reliable was his information, he replied, "As reliable as Time magazine could be." This, coupled with the sound of artillery a few miles away, prompted immediate respect by the pilots and enlisted men of the 307th Fighter Squadron, 31st Fighter Group who operated from the Anzio beachhead in Italy during World War II.

The proximity of the enemy restricted most of us from visiting the South Korean capitol, with the exception of Capt. J. O. Roberts and Capt. Nick Farrell. Ignoring the presence of snipers and land mines, they roared into Seoul and commandeered a piano from a local high school by convincing the principal that valuables of this sort were being moved south for safe keeping.

The gentleman was kind enough to help load the instrument into the half-ton truck, thus contributing to the dedication of the first USAF officer's club at K-14, popularly called Club 335. The club operated only after 1700 hours: otherwise, it served as living quarters for six of us including Flight Lt. Amer Levesque, RCAF, and Lt. Cmdr. Paul Pugh, USN (later Rear Adm. Pugh).

It was during the popping of beer cans and J.O.'s rendition of "If I Knew You Were Coming, I Would Have Baked a Cake" that Nick Farrell and I were informed that we were scheduled for tomorrow's mission—takeoff 1100 hours.

22 DECEMBER 1950

The morning broke bright and clear., followed by a resplendent sun moving along its winter path across "the land of the calm" and the China Sea to awaken the sleeping giant—China. During the night a cold air mass from Siberia had blanketed the area with a 15 above zero temperature.

Maj. Zack Taylor, Wing Operations Officer said, "Good morning guys" as we shuffled into the operations tent, all gravitating toward the small oil-burning stove located between the door and the flight-schedule board. Zack had already made the aircraft assignments. The pilot flight schedule had been made out the night before: Lt. Col. Don Nance, Red Flight Leader; Capt. Bud Bock, #2 position right wing; Capt. Nick Farrell, #3 position element leader; and myself, #4 position.

I silently questioned the wisdom of scheduling Nance and Bock because of the perils that could be expected high above the Yalu River. I was not questioning the professional abilities of the two, but their currency in the F-86. Both Nance and Bock had little experience in the aircraft; Nance a bit more than Bock, but no aerial gunnery. I felt, along with Nick, that we should utilize only the highly experienced F-86 jocks until we gained some constructive knowledge of the MiG's performance.

Both Nick and I had been flying jets since 1946, starting with F-80s, then F-84s, graduating into the swept wing Sabre in early 1950. This coupled with our World War II experience, was about the best insurance policy available for the price!

Zack, with a poverty of enemy intelligence, briefed that we would probably be under the enemy radar surveillance once in the Sinuiji area, air-sea rescue would become wanting that far north, and if shot down and interrogated, tell all they wanted to know about the F-86. The language barrier would take care of the rest.

At 41,000 feet, 180 knots or Mach 0.6, we started our fighter sweep up the Yalu. These flight parameters put the flight in a very compromising position. The sun was at 6 o'clock. The odds in favor of the MiGs were going up fast! We flew northwest, paralleling the Yalu in a spread formation. This placed me to the left of the flight and approximately a mile inside North Korea, affording a clear view of China, especially Antung, the MiG base.

Nick called, "I can see MiGs taking off."

I replied, "Roger."

"I can see the dust," Nick reported, "They appear to be climbing to the south."

With all the winter clothing I had on, it was hard to move. As I struggled to look back and down, I saw the sun glittering off what appeared to be tiny silver specs out over the Yellow Sea.

Nance responded, "Roger, keep them in sight."

My hands were beginning to sweat and my shoe packs were uncomfortable. I thought, we have got to get our speed up: otherwise, we are sitting ducks. I called Red Leader, "Let's get some speed for Christ's sake!"

Nance replied, "Roger, let's do a 180 to the right."

In a combat spread formation, my aircraft would move quickly from left to right crossing over the other members of the flight in order to cover their 6 o'clock areas as they maneuvered into their new position, back down the Yalu.

The instant I made my right break, Nick who was now behind me also turned right and screamed, "MiGs at 6 o'clock!"

I immediately dropped my external tanks, turned my gun switches on and looked into the sun which now was on my right. I first saw the contrails and then the MiGs slightly above and behind or where I had just been. This left no doubt in my mind that we were in deep trouble. I pushed over to get maximum acceleration, inviting immediate wing roll, an aerodynamic phenomenon characteristic of the F-86 which I didn't need at this time!

Nick called, "They got Bud." Bud managed to bail out and was a POW for the rest of the war. I looked to my left and down and saw a Sabre in a screaming dive headed toward the Yalu with flames shooting from beneath. I was leveling at 30,000 feet when Nick appeared on my right wing.

"Where's Nance?" I asked.

Nick replied, "He spun out."

I then told Nick to move out to my right so that we could cover one another. "How many MiGs did you see, Nick?"

"Twelve."

"Roger, that's my count too."

Nick called, "They're at 6 o'clock pulling connies (contrails); let's head south."

"Roger," I replied, "I see them."

With the sun no longer a communist, I could count 12 MiGs, six abreast. I called to Nick, "They're coming up your rear; I'm breaking into them."

"Roger, Jim, let's get a scissors action going but keep bugging south."

"Roger," I replied. With this type of maneuver, we were leading them south away from their sanctuary. After several half-hearted passes, they broke off the action. I pressed the mike

button, "Nick, they're headed for the deck; let's go after 'em!" Nick's sardonic reply, "Let's keep our altitude. That's all we have going for us"

Running through my head that day was Kipling's poem:

"That Day"
We was rotten 'fore we started
We was never disciplined:
We made it out a favour if
An order was obeyed.
Yes, every little drummer had 'is
Rights an wrongs to mind,
So we had to pay for teaching—
An' we paid!

The MiG pilots' victory celebration was short lived. At 1500, following the morning flight, Lt. Col. J. C. Meyer led a section of eight Sabre jets to patrol the Yalu. Sixteen MiG pilots with more confidence than expertise bounced the Sabres, losing six MiGs in the encounter. This engagement, once and for all, established air superiority over North Korea by the USAF, thus allowing the United Nations ground and sea forces complete immunity from enemy harassment for the remainder of the war.



Photo courtesy of Sabre Jet Classics
The North American Aviation Field Service Tent at K-13 Suwon AB, Korea operated by John Henderson in 1951.

P-38 Rescue In Romania
(continued from page 5)

Poltava (See Winter 2004 Issue) when the Ops radio crackled that a P-38 was coming in from Foggia, Italy with two men aboard and they were going to land on a straight-in-approach. It wasn't a request, but a take it or leave it statement. To the Operations Staff's further consternation, they rolled to a stop right outside the entrance flaps in a cloud of dust and shut down the engines, the "Odd Couple" had landed and the mission accomplished.

After the Fact:

Dick Willsie is the only single-seat fighter pilot who on a single mission and due to enemy action, flew two different single-seat fighters performing a take-off and landing in each. Dick Andrews is the only pilot to be officially credited with copilot time in a P-38 including one hour on instruments.

In 1947, Dick Willsie and Dick Andrews were awarded the "Order of the Red Banner"; the highest Russian decoration accorded foreign allied personnel.

Editor's Note: Richard Willsie is currently retired and residing in Huntington Beach, CA. Richard Andrews is also retired and living in Blue River, OR. His squadron mates are petitioning Congress to award him the Congressional Medal of Honor.

Congratulations and Best Wishes to

Ralph and June Ruud of Valencia, California
celebrating their 75th Wedding Anniversary

Warren and Maxine Bratfisch of Mesa, Arizona
celebrating their 63rd Wedding Anniversary

Larry and Kathryn Larsen of Chester, California
celebrating their 67th Wedding Anniversary

Tom and Clare Lee of Sedona, Arizona
celebrating their 51st Wedding Anniversary

Joe and Betty Onesty of Seal Beach, California
celebrating their 60th Wedding Anniversary



Ralph H. Ruud, being honored by Northrop University with the Degree of Doctor of Science, Honoris Causa, for his countless contributions to Aerospace in a career that spanned 43 years from wood and wire biplanes to moon exploration spacecraft

43rd Annual Bald Eagles Reunion

photos by Lee French



Guest Speaker Howard Chambers



Charter Member Al Purcell



Joe Onesty, Sam Iacobellis, and Mac Blair



Beverly Gresham and Ann Tack



Andrew Frazier, Rubye Richey, Karen Fraser, and Joan Armour



Pat Cunningham



Marge and Dale Myers, Bill Dean, and George Fraser



Val Yarbrough



Test Pilot Arch Lane and Robbie Lane



Leo Herm, Andy Anderson, Pete Peterson, and Chuck Spade



Chris Bader, Art Goudreault, Jack Schultz, and Jack Beigle



Sonnie Robertson and Ed Rusinek



Donna and Bill Bright



Debbie and Howard Chambers



John Moore and Gale Moore



Sam Iacobellis



Walt Bailey, Edward Funke, and Bill Taylor



Florence and John Hoffman



Frank O'Leary, Don Dodson, and Ralph Morris



Jack Grimes and Wes Fisher

We Are Concerned!

We include the SILENT MAJORITY in our publication as a final salute to those of you that have been called to the other side. What concerns us is the number of you that are taking that final journey so soon! Our list runs over forty names every three months. To stem the tide, we have come up with a list of Dos and Don'ts to keep you with us as long as possible.

- ♦ Don't allow yourself to lose your temper. Anger is non-productive and only raises your blood pressure.
- ♦ Have a preventive checkup regularly, you do it for your car, why not your body?
- ♦ Take your medication diligently as prescribed by your doctor
- ♦ If you are diabetic, check your numbers often and try to stay within safe limits.
- ♦ Don't cosign any loans and don't lend anyone any money—especially to your "kids".
- ♦ If you must transact money—borrow some and let the other guy worry about getting it back.
- ♦ If you are overweight, eat less and lose some pounds—Remember, the gates of Heaven are very narrow!
- ♦ Reduce your intake of meats and fats. Replace them with grains, vegetables and fruits.
- ♦ Have a glass of a quality red wine with your supper—Don't touch any white wines, that stuff will kill you!
- ♦ After supper, don't plunk in front of the TV for the rest of the evening. Instead take a 1/2 hour walk.
- ♦ Try to extend that walk every day until you reach an hour.
- ♦ If your "Soul Mate" is dead and you feel lost—stop moping and get active—you will join your loved one soon enough.
- ♦ When someone asks, "How are you?" Say you are "SPLENDID" even if you are not. You will be rewarded with a smile.
- ♦ If you are faced with a heavy burden, visit your church or temple and ask God for help.
- ♦ Prayers are never wasted—if you feel more prayers are needed, drop us a note and we will add you to ours.

If you feel that you have just been scolded, it's because we want you around for a long time. You are family and we love you!

The Staff of the NAA Retirees Bulletin

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♦ Silent Majority (Date of Death)

♦ Keith V. Andersen (11/18/2004)
♦ Arnie N. Birdsill (11/06/2004)
♦ Dominic F. Birgen (01/19/2005)
♦ Daniel W. Cramer (2003)
♦ Don R. Federspiel (06/13/2002)
♦ Frank Fong (04/27/2004)
♦ Art Foster (06/27/2003)
♦ Mel Fowler (12/10/2002)
♦ George R. Gehrkens (04/13/2003)
♦ Helen R. Hartberger (12/05/2004)
♦ Quinton C. Harvey (01/28/2003)
♦ Wayne I. Heinmiller (05/31/2002)
♦ John S. Hesseldenz (2004)
♦ Fred J. Hill (11/11/2003)
♦ Robert W. Koeppe (05/03/2005)
♦ Vincent H. Leccese (02/26/2004)
♦ Fred E. Ledonne (06/09/2004)
♦ Ralph E. "Pete" May (03/20/2002)
♦ William R. Miller (12/01/2001)
♦ Charles A. "Chuck" Moore (01/23/2004)
♦ Dick Morley (08/05/2003)
♦ Marianna Owen (01/24/2005)
♦ George Pappas (11/15/2002)
♦ Paul F. "Pete" Peterson (10/23/2004)
♦ William T. M. "Swampy" Roberts (12/23/2003)
♦ Woodrow W. "Woody" Robinson (02/29/2004)
♦ Lloyd C. Schmidt (09/12/2001)
♦ Robert S. Sexton (09/05/2001)
♦ Thomas K. Shuler (04/09/2001)
♦ Paul E. Steele (03/02/2002)
♦ Sarkis V. Vartanian (01/26/2005)
♦ Melvin L. Wilson (03/03/2001)

Contrails From The Past

by Ed Rusinek

Dear Ed,

The articles about the Fury in the Spring 2005 issue brought back memories of my earliest days with NAA in Columbus. Mac Blair, then the Chief Aerodynarnicist, assigned another young engineer, Jerry Martin, and I to minimize the drag caused by the canopy on the FJ-4. Our efforts were largely based on the NAA Aerodynamics Manual. Each iteration lengthened the afterbody. Meanwhile, concerns with lateral stability, extended a fin forward from the vertical tail. The Preliminary Design Group decided to connect the two with a ridge.

How much of the fuselage was dedicated to the engine bay and air duct was evident when this little ridge immediately became a tunnel for hydraulic lines and electrical cabling. The next revision of the NAA Aerodynamics Manual adapted our findings and calculations. Our "ridge" is clearly visible in the photo of the FJ-4B in flight.

—Otto Juelich, Columbus, OH

Ed's Resp.:Thank you, Otto! We sincerely appreciate when readers add their own experiences or participation in a program reported in the NAARB.



Photo Courtesy of Tyson Rininger

Dear Ed,

The Spring 2005 Issue was of great interest to me due to the articles about the Fury FJ-2, -3 and -4 Series, the OV-10 and Ed Gillespie. I flew the FJ-2, -3 and -4 in the Navy with the FJ-4 being my favorite airplane until I flew the RA-5C Vigilante at Columbus.

I was one of two Navy pilots who flew the FJ-4 through nuclear "test device" blast, thermal and radiation fields at the AEC Nevada test site in 1957. On one "shot" the wingtips flexed up four feet and rebounded down two feet with a near instantaneous 4 1/2 G's recorded. It also blistered the small gun sight radar ranging dome on the nose and some paint on the belly. It got my attention Big Time! But the airplane really had no problem.

In January 1965, I was hired at Columbus by Ed Gillespie as an engineering test pilot, arriving just in time to take part in the entire OV-10 development program. Emerson Smith's article contains a few inaccuracies due, no doubt, to the lapse of some 35 to 40 years. For one, I was the test pilot for the rough field landing demonstrations. Which is not to take anything away from Ed Gillespie, who as a test pilot has "done it all". Ed did come to Pax River and did one flight on the "short period oscillations" to confirm that the physiological reactions of the pilot were the limiting factor of the obstacles.

Emerson also errs in describing the sine wave obstacles as thirty inches high! Whew! There were two different sets of sine wave obstacles. One set was 12" high with a 600" (50 ft) period and the other 6" high with a 200" (16 1/2 ft) period, with 500 ft of each to drive through. The big ones were impressive but no problem. The 6" shook the airplane and the pilot at frequencies up to 10 cps. The natural frequency of the pilot, approximately 5 cps, occurred at about 50 knots with Ed's and my internal organs, arms, legs and eyeballs going into resonance. The results were chest pains, flapping arms and legs and totally blurred vision. Meanwhile, the airplane was just fine!

Eventually, the 6" bumps were reduced from 500 ft to 33 1/3 ft, just two sine wave bumps, to avoid the pilot resonance and we completed the demo on them to over 100 knots. We also had to land against a 3" 90° curbstone and a 4" high sine wave with a 30" period, except the nose wheel obstacle was a 4" by 10" period. Impact bad to occur with at least 50% of the maximum vertical landing load of the design maximum sink rate, which was 18.8 ft per second for the production airplane.

Also, rolled and yawed touchdowns were required with 25% reduced tire and shock strut pressures with shock strut oil level 10% low. It is no wonder that Emerson couldn't remember the rough field details. I couldn't either, until I dug out the AIAA paper which the landing gear designers, Ted Smiley and Charlie Cook and I coauthored on the gear design and demonstration.

I believe the real unsung and almost forgotten accomplishment achieved on the OV-10 was the aerodynamic tab boosted aileron and elevator control system. Using only a mechanical system, the airplane had very nearly the handling characteristics of the FJ Fury series, which were fully hydraulic, from stall speed to 432 knots. Others had built aerodynamic tab boosted systems, Piper for one, but none had made one that operated over such a wide speed range.

I must say that I thoroughly enjoyed flying for the Columbus Division. Well, getting my guts scrambled as described herein and the inverted spin tests were not my favorite things. However, I always considered it a privilege to fly the completed products of all the people who designed and built these airplanes, even after we were renamed Rockwell. It was like being the one chosen to sit atop the pinnacle of a huge pyramid of people and enjoying the fruits of their labor!

—Arch Lane, Cypress, CA

Ed's Resp.: Ouch! My guts ache from just reading about those rough landings. Great letter! But now, Arch, we are going to expect some more great stories from you in our future issues!

The Silent Majority

by Stan Guzy

BACHMAN, SHERLEY, 89 – passed away on July 26, 2004 in Clovis, CA. Sherley worked in tooling at LAD until she retired.

BARNETT, MAXINE A., 92 – passed away in Flagstaff, AZ on March 19, 2005. A widow, she learned to be a stenographer, joined North American Rockwell and worked on the Apollo program in Downey until she retired at 65. Called back twice, she worked until 1985. A longtime resident of Downey, she served as president of the Downey Rose Float association for many years.

BRIGGS, GLENN W., 87 – passed away on February 16, 2005 after a valiant battle with cancer. Glenn ended a 40 year career of service with the Federal Government as the Deputy Program Manager,Apollo Program at Space Division. He then served for 10 years at Rockwell in Littleton, CO as a Senior Quality Control manager on the Space Shuttle. His ashes were taken to Colorado to be interred with his wife Vivian.

BURNSIDE, MILDRED I., 96 – passed away on February 4, 2005 from undisclosed causes at West Anaheim Extended Care in Anaheim, CA. Mildred had worked at the Autonetics facility before she retired at 65.

BUSH, JOHN D., 87 – died from complications following congestive heart failure on January 19, 2005. John joined NAA in 1943 and worked on many aircraft programs including B-25, F-82, Navion, B-45, F-86 and FJ, F-100, T-28, A-2J, XB-70 and the B-1. He retired in 1978 but returned as a consultant in B-1 GSE engineering for two years. He is survived by his wife Beverly.

CLARK, CLAYTON C. "CLAY", 80 – passed away on April 28, 2005 from pneumonia and a heart attack in Locust Grove, VA. He worked in the aerodynamics group at LAD from the early 1950s to the early 1960s.

DAVIS, NELLIE B., 85 – died in Placentia, CA on February 16, 2005 from Alzheimer's disease. Nellie served in manufacturing planning at Space Division in Downey.

DICK, HARVEY D., 80 – died on February 4, 2005 in Las Cruces, NM after a long illness. He was an engineer on the Apollo Earth Landing System and was involved in much of the testing done at White Sands Testing Facility in NM. He retired from the Space Division in December 1979 and was rehired in November 1982 and retired again in March 1988 from the B-1 Division. He is survived by his loving wife Luella.

DUCOBU, JEAN A., 86 – died of natural causes on April 15, 2005 in Placentia, CA. Jean had been a plant supervisor before he retired from Rockwell International.

FARQUHAR, GLORIA, 68 – passed away in Carson, CA of cancer on March 25, 2005. Gloria retired from LAD in 1992 after 32 years of service.

HANSEN, SHERRILL M., 57 – passed away on July 29, 2004 in Palmdale, CA. Sherrill started at LAD in tool control and then transferred to Palmdale where she served in requirements control.

HERNER, JAMES P., 62 – died on June 18, 2004 of cardiac arrest in Orange, CA. Jim retired from Missile Division in 1997 with 34 years of service in engineering. He is survived by his loving wife Elizabeth.

HUNTLEY, ALICE, 87 – passed away at her home in Lake San Marcos, CA on February 15, 2005. A graduate of the University of Oklahoma, she moved to California and served as executive secretary to "Dutch" Kindelberger, Chairman of the Board of North American Aviation. She is survived by her loving husband Cliff.

JOHNSON, BARBARA C. "BOBBIE", 79 – died on February 18, 2005 at Little Company of Mary Hospital in San Pedro, CA. She graduated from the University of Illinois at the age of 20, the first woman to receive a degree in Civil Engineering. She joined NAA in 1946 at LAD and, subsequently, moved to the Aerophysics Laboratories in Downey to work on the Navaho. Her technical and engineering management skills spanned the Navaho, Hound Dog and Apollo programs. Her ability to explain complex technical issues in simple layman language won her world recognition from national leaders and such media moguls as Walter Cronkite. Among her many honors and awards, she was a Fellow of the Institute for Advancement of Engineering. She is survived by her loving husband Harold Lee. Barbara's story was featured in the Summer 2004 issue of the NAARB.

JONES, ROBERT R., 83 – passed away on April 4, 2005 after a brief illness with heart disease. Bob began his career in 1955 as a mechanical engineer at NAA. He retired in 1987.

KERR, JAMES M. "JIM", 70 – died on April 21, 2005 in Sandpoint, ID after a yearlong battle with cancer. Jim had a highly successful career in senior management positions at NAA/RI during the Apollo/Saturn/Space Shuttle programs. He was named Corporate Director of Procurement and Business Systems at RI/Collins until he retired in 1994 after 40 years of service. His wife Charie survives him.

KING, CHANDLER "CHAN", 93 – passed away peacefully on April 10, 2005 in Santa Barbara, CA. Chan was one of the last six remaining charter members of the Bald Eagles which originally included only those that made the trek from Dundalk, MD to Inglewood, CA. He retired from Space Division in 1975 after 40 years of service.

KINGSWOLD, JACOB G., 88 – passed away at home in Torrance, CA on April 3, 2005. Jacob retired in 1978 after 40 years of service in engineering mockup at LAD, Downey and Autonetics. He is survived by his loving wife of 52 years,Yvonne.

KOEPPE, ROBERT W., 69 – passed away in Lake Havasu City, AZ on May 3, 2005 of a massive heart attack. Bob retired in 1995 from Autonetics after 37 years of service. He was a manager in Marine Systems. He is survived by his loving wife Rosemarie.

LANHAM, PARIS L., 85 – a longtime resident of Lancaster, CA, Paris died in Massachusetts where he lived with his son. He was an engineer with North American Rockwell for 35 years before retiring in 1978.

LINDEWALL, GEORGE W., – died April 9, 2005 of congestive heart failure. He lived in Fullerton, CA and had worked at NAA/RI as an electrical engineer. He is survived by his wife Marilyn.

MEECHAN, CHARLES "JIM", 76 – died on February 21, 2005 in Woodland Hills, CA of pancreatic cancer. Jim began his meteoric career at North American Aviation in 1951 at Downey as a researcher. He established the chief technical office for the company and became the Corporate Vice President of research and engineering in 1972. He published twenty papers in acclaimed science journals and established an international reputation in solid state physics. He was deeply involved in the

nation's space program and retired in 1984 to dedicate the rest of his career to his writings, musical composition and video, including a one hour video entitled "Space, the 25th Year and Beyond". It was selected by the Planetary Society as a featured history of the U.S. achievement in space exploration. He is survived by his loving wife of 53 years, Bunny.

MORGAN, ROBERT C., 83 – passed away in Los Alamitos, CA on March 24, 2005. Bob worked as a research engineer at Rockwell International for 38 years and retired in 1983. He joined his wife Mercer in operating Mercer's Hallmark store in Los Alamitos. In 1986, they retired to Bishop, CA where he became a master woodcarver and avid fisherman. He is survived by his loving wife Mercer.

MUNDS, FRANK W., 84 – died at home in Lancaster, CA on April 8, 2005 of natural causes. Frank served as a flight test engineer for 30 years at Palmdale and Edwards AFB on several aircraft, including the XB-70 and the B-1. He retired in 1977 from LAD. He was highly respected by his colleagues for his technical abilities. He is survived by his loving wife of 62 years, Eve.

NELMS, SARAH, 91 – died of natural causes in Mission Viejo, CA on March 25, 2005. Sarah was a retired secretary from NAA/RI.

PARKER, RICHARD D., 81 – died of undisclosed causes on April 15, 2005. He had worked as a cost analyst at Autonetics.

PARKS, DAVID F., 66 – passed away at home in Long Beach, CA of cancer on April 4, 2005. David joined Rockwell International in 1979 after retiring from the USAF. Supervising the calibrations laboratory, he participated in the Star Wars Satellite Defense System program. He retired in 1989 and is survived by his loving wife Vicki. Burial was at the National Cemetery in Riverside.

PERKINS, VIRGIL V., 80 – died on February 21, 2005 at his home in Bourbon, MO from lupus and idiopathic fibrosis. He joined NAA Autonetics in 1952 and served in key engineering management positions. He was the Program Manager on the MK2 SINS and other Navy programs. As a result of successful testing, adaptation and demonstration of inertial navigation systems on Navy vessels, the Marine Systems Division was formed to install SINS in the Navy nuclear submarine fleet. Virgil retired in 1982. He is survived by his wife Billie.

POWERS, JACK L., 78 – passed away in Torrance, CA on February 16, 2005 of cancer. Jack worked at LAD for over thirty years as an engineer. His wife Lucille survives him.

RALEY, HAROLD R. "HAL", 79 – passed away of cancer at home in Fallbrook, CA on February 21, 2005. He retired from LAD tooling supervision in 1984 after 35 years of service. He is survived by his loving wife of 58 years, Mary.

RING, WILSON S. "PAT", 92 – passed away in Vista, CA on May 2, 2005 of undisclosed causes. Pat retired in 1974 after 30 years of service at LAD as an aviation flight line mechanics trouble shooter. He is fondly remembered by many LAD co-workers who utilized his skills as an able and honest auto mechanic. He is survived by his loving wife Kathleen.

SHOWALTER, JOSEPH R., 89 – died on April 29, 2005 in St. George, UT. Internment was in Panguitch, UT.

SHULTZ, ALVY P., 89 – passed away in his sleep at home in Hawthorne, CA on April 25, 2005. Alvy joined NAA in 1941 and retired with 38 years of service from LAD in 1978 as a supervisor in experimental fabrication.

SIMO, THERESA, 71 – died of cancer on January 25, 2005 at her home in Placentia, CA. Terri worked for many years as a receptionist in the operations center at Autonetics Electronics Systems.

SMITH, RAYMOND O., 77 – passed away peacefully, surrounded by his family, on April 20, 2005 after a courageous battle with cancer. Ray worked his entire career in quality assurance, primarily at Rocketdyne. He is survived by his devoted wife of 48 years, "Harsy".

STACKHOUSE, WILLIAM V., 90 – died of natural causes on April 26, 2005. He was a retired NAA/RI engineer living in San Juan Capistrano, CA.

TAFF, ALFRED, – died suddenly on April 16, 2005 of a heart attack in Oxnard, CA. He worked in manufacturing engineering at LAD before tranferring to Rocketdyne where he became manager of production engineering. He retired in 1980 after 34 years of service. His caring wife Ellie survives him.

TRICHE, HENRY W. "HANK", 83 – died on February 13, 2005 in Van Nuys, CA. He joined NAA in 1946 and retired in 1990 after 44 years of service. Hank was an engineer on the F-86D and F-100 and a project engineer on the XB-70 and B-1A and B. He was preceded in death by his loving wife Barbara.

VAUGHN, STANLEY I., 87 – passed away of cancer on March 19, 2005 in Columbus, OH. Stan began his engineering career on the Curtiss SB2C Helldiver and became the first plant manager when Curtiss Wright opened the Columbus facility in 1941. He later joined NAA at Columbus and worked on the R3J/RA-5C Vigilante. He retired in 1983.

WADE, DANA, 72 – died on April 11, 2005 in Palm Desert, CA. He started in engineering on the Hound Dog program in 1960 and moved to material on the Apollo and Space Shuttle programs. He retired in 1990 from Downey after 30 years of service. Dana is survived by his loving wife Kathleen.

ZIMA, KENNETH – died on March 7, 2005 of cancer in Torrance, CA. No further information provided.

IN PASSING

ONLY 14 OF THE 41 RETIREES LISTED IN THIS FINAL SALUTE WERE SUBSCRIBERS TO THE NAA RETIREES BULLETIN. HOW VERY SAD THAT THE ONLY CONNECTION MOST OF OUR RETIREES HAVE TO THEIR BULLETIN IS WHEN THEIR NAME APPEARS IN THE *SILENT MAJORITY*.



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Photo courtesy of Sabre Jet Classics

The North American Aviation F-86A assigned to Lt. Col. Glenn Eagleston being serviced in 1951 at the desolate airfield just south of Seoul, Korea designated as K-13, Suwon Air Base. Since Westerners were having difficulty in pronouncing Asian names, the K-numbering of airfields in Korea was adopted early in the war to provide easier identification. Although the initial Korean airfields were generally established by Japanese occupation forces during the Pacific War, the United Nations Forces built additional airbases and applied subsequent K-numbers.

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION Retirees Bulletin

Fall 2005

Inside: **A PLANE AHEAD OF ITS TIME – THE A3J/RA-5C VIGILANTE**
by Erik Simonsen
FLYING THE F-100 SUPER SABRE WITH THE THUNDERBIRDS
by Gerald Larson
SPACE SHUTTLE: A FITTING CLIMAX TO A GLORIOUS HISTORY
by John Peller



NASA Photo

On August 9, 2005, the Space Shuttle orbiter DISCOVERY returned the seven-member Return to Flight crew safely back to Earth after completing a very successful mission to the International Space Station. The STS-114 astronauts are from left to right: Mission Specialist Steve Robinson, Commander Eileen Collins, Mission Specialists Andy Thomas, Wendy Lawrence, Soichi Noguchi, Charlie Camarda, and Pilot Jim Kelly. This was the thirty-first mission of DISCOVERY into space. Is was the third delivery of the Multi-Purpose Logistics Module (MPLM) named Raffaello to the Space Station. The MPLM is essentially a space moving van to transport supplies to the orbital outpost.

NORTH AMERICAN AVIATION
Retirees Bulletin

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DEAR NAA RETIREE BULLETIN SUBSCRIBER

The year is half over and here we are with the Fall 2005 issue. Fortunately, we have been blessed with some terrific authors so we do not lack for excellent stories. Our well known author of the "Peek at the Past" articles, Erik Simonsen, has completed the story of the Vigilante airplane designed and built at our Columbus Division. Major General Gerald Larson, USAF Retired, has continued relating his experiences with the F-100 as a member of the "Thunderbirds". Finally, we are very proud to present a great report by Dr. John Peller on the Space Shuttle and its role in the history of North American Aviation. If this article does not awaken in you a great sense of pride in having been a member of the NAA team, then you must be brain dead!

In July, the U. S. Postal Service issued a sheet of ten stamps hailing "America's Advances in Aviation". The planes portrayed are the Boeing 247 and B-29, Consolidated PBY and B-24, Grumman F6F, Republic P-47, Lockheed P-80, Northrop YB-49, Beech Bonanza and the Ercoupe 415. A special souvenir sheet of the ten stamps illustrates the North American Aviation P-51 in the margins almost as an afterthought. We have no criticism of the planes selected. However, to omit the great planes designed and built by NAA which often arrived just in time to wrest air supremacy from the enemy is beyond comprehension. But, this is what we can expect that once our generation passes, the only reference to NAA will be as a footnote in some obscure dusty aviation study of the past.

To give you a little chuckle, we have included in this issue some ads from a **NORTH AMERICAN LOG** of 1939. The LOG was the monthly OFFICIAL PUBLICATION of the NORTH AMERICAN AVIATION EMPLOYEES with a monthly circulation of 3,400 copies. Today, we may find these small vignettes or clippings amusing. But, in those days, with the Nation staggering from a devastating Depression and the Aviation Industry still struggling in its infancy, life was anything but amusing. That year, each employee received a turkey as his Christmas bonus with a heartfelt letter of appreciation from "Dutch" Kindelberger. Can you pick out those ads from our yesteryear?

RENEWING YOUR SUBSCRIPTION FOR 2006

If the date above your name on the address block (Page 16) is December 2005, your subscription ends with the Winter 2005 issue. Our splendid Membership volunteer, Sonnie Robertson, takes on the horrific task every Fall to print, address and send out over 1,600 reminder cards to those whose subscriptions are coming to an end. It is not only a huge expense in money but also in time and effort. It would be a tremendous help to us; if your subscription ends in December 2005, that you send in your renewal check early so that we can reduce this added task. Just make out a check to Bald Eagles, Inc. for $10.00 or more and write on it "2006 Renewal". Send it to:

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We appreciate your continued sponsorship and we are always interested in your comments and criticisms. In future issues, we hope to provide more stories from the various NAA/RI divisions. With your support, we shall continue to provide a volunteer publication that will reflect our pride in what was accomplished in all phases of aviation and aerospace by the extraordinary people that wore the badges of North American Aviation and Rockwell International.

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NAA/ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Frank Zelinski at (562) 866-3195.

The Antelope Valley Retirees Club meets in the South Meeting Room of the Palmdale Culture Center at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell/Boeing retirees are welcome. For information, contact Bill "Tiny" Kistler at (661) 273-0213.

Boeing Valley Retirees Club meets on the 3rd Thursday of each month at the Canoga Park Rec Center, 8500 Fallbrook Avenue, Canoga Park, CA. The president is Jrnnie Muncaster at (818) 341-8919.

Boeing Retirees Breakfast Club meets on the 1st Wednesday of each month at 8:00 AM for breakfast at IHOP Restaurant, corner Fallbrook and Vanowen in West Hills. Contact Howard Seese at (818) 344-7861.

"The Old LAD Stress Group" meets for breakfast approximately every two months at Mimi's Café in Torrance, CA. If you are from the old LAD Stress Group contact Gene Laxton at (310) 378-3113 or Ed Rosenthal at (310) 375-8933.

"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meet at 11:30 AM on the 2nd Wednesday of the month for lunch at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd and Mariposa Ave.

The NAA 101 Tooling Retirees Group meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at Billy's Restaurant, 5160 190th St., west of Anza Avenue in Torrance, CA.

GPS Breakfast Club meets from 6:00 AM to 8:00 AM every Wednesday at the Primrose Restaurant, corner Seal Beach Blvd. and Westminster Blvd. All are invited. For more information, call Fred Shitara at (714) 750-1016.

Seal Beach Retirees Group meets at 11:30 AM on the 3rd Wednesday of the month at "The Fish Co". on Los Alamitos Blvd. at Katella Avenue. For more information call Marvin Blaski at (714) 848-5717 or e-mail to *mblaski@aol.com*.

The Facilities, Industrial Engineering and Plant Services Retirees Group meets at 11:45 AM on the 2nd Thursday of each month at Buster's (formerly Jolly Roger's) Restaurant in the Long Beach Marina. Contact Joe W. Mausser at (562) 596-5845.

"Ye Olde Pharts Breakfast Club" meets at 10:00 AM on the 4th Thursday each month for breakfast at Polly's Pies at 2025 N. Tustin Avenue in Orange. For information call Don Metzger at (949) 495-5374.

The North American Rockwell Retiree Club of McAlester, OK (a satellite of Tulsa, OK) meets at 10:30 AM on the 3rd Tuesday in March, June, September and December at the Down Town Meeting Place. Call J.A. Darden at (918) 423-0706 for more information.

Tulsa & McAlester Retirees meet for breakfast at 8:00 AM on the 2nd Monday in March, June, September and December at the Ramada Inn, 8181 East Skelly Drive in Tulsa, OK. Call Harry Phillips at (918) 838-3716.

The North American Rockwell Retirees Group of Columbus, OH Engineers and professionals meet at 11:30 AM on the 3rd Thursday of each month at the Berwick Park House. Contact Byron C. Solomides at (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH meets at Noon on the 1st Monday of the month at the Whitehall Community Park on North Hamilton Road in Whitehall. Contact E. Hamilton at (740) 927-5940 for information.

Autonetics Group including Marine Systems, Program Office, Project Office, System Test, Engineers and Designers meets for lunch on the last Wednesday of each month at the HomeTown Buffet, Rose Avenue and Alta Vista Drive in Placentia, CA. Call Mike Vohs at (714) 762-1925 for more details.

Autonetics Industrial Engineering and Maintenance Retirees meet for lunch on the 1st Thursday of each month at the HomeTown Buffet, 390 McKinley, located in front of the Home Depot, in Corona, CA. For more details, call Don Burk at (909) 698-0072.

Autonetics Flight Control Retirees meet at 11:30 AM on the 3rd Thursday of each month except in December at The Lamppost Pizza House located at 17568 Yorba Linda Blvd., corner of Richfield Road, in Yorba Linda, CA. Call Jim Anderson at (714) 779-5620 for details.

Autonetics Retirees meet for lunch at 11:45 AM on the 2nd Wednesday of every month at the Rembrandt Restaurant or Yorba Linda Country Club. All Autonetics retirees, spouses and friends are invited. Contact Robert Nease at (714) 516-1844 or e-mail to *rfnease@email.msn.com* or Ed Venanzi at (714) 779-5652 or e-mail to *EdVennz@aol.com*.

A Group of NAA Retirees meets for breakfast at 8:15 AM on the 1st Wednesday of each month at Knott's Berry Farm-Chicken Restaurant. All are cordially invited. Contact Maxine Haun at *maxi3131@sbcglobal.net*.

Autonetics Financial Luncheon Group meets for lunch at Noon on the last Wednesday of the month at Marie Callendars, 126 East Yorba Linda Boulevard in Placentia. Contact Ken Cantwell at (714) 970-7171 or e-mail *Kcantwell@adelphia.net*.

A Group of Engineering Mgt. meets at 11:30 AM on the 3rd Tuesday of the month for lunch at Denny's on Imperial Hwy. and the 57 Fwy. Call Ed Moran at (562) 697-9949 for information.

NAA Tech Reps Assn. (TRA) Breakfast Club meets at 9:00 AM on the 1st Tuesday of each month at the Carlsbad Airport Restaurant. For more information, call El Presidente Rafael Colunga at (760) 940-0525.

Material Group retirees from Downey and Seal Beach meet at 11:30 AM on the 4th Wednesday of every month at the Stox Restaurant at Imperial Hwy. and Bellflower Blvd. in Downey. Contact Marian Nielson at (562) 429-1020 or Joan Dominguez at (562) 865-7200 or e-mail to *tatedom@aol.com* for information.

Rockwell Vandenberg AFB Retirees Breakfast Club meets at 8:45 AM on the 2nd Tuesday of each month at the IHOP Restaurant in Santa Maria. Contact Marv Bailey at (805) 929-6552 or Al Finlay at (805) 937-3690.

The Hangar Gang meets at the Proud Bird approximately every 4 months. For time, date and other details, call Gene Salvay at (818) 788-3974 or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

ANNUAL EVENT

Bald Eagles 44th Annual Reunion – will be held on Saturday, April 8, 2006 at the Proud Bird Restaurant. Call Val Yarbrough at (805) 646-2283.

Flight Test Instrumentation Annual Reunion – meets annually at the Fullerton Elks Club. For information, call Frank Vigil at (562) 691-0236.

Tech Rep Association Picnic – A group of retired Field Service Technical Representatives has a yearly picnic in June at a park in Fallbrook, CA. For more information, call TRA President Rafael Colunga at (760) 940-0525 or e-mail to *rafael@nctimes.net*.

The Annual M&P, P.D.L., "Friends Christmas Luncheon" – This group of retirees and employees have assembled in mid-December for a festive luncheon and gabfest for the past 20 years. Those wishing to participate and receive notice of the next December luncheon, call Fred Koeller at (310) 545-8854.

ICBM Reunion – 45th Anniversary of First Minuteman Launch will be held at the Radisson Resort at Cape Canaveral, January 30 through February 1, 2006. Contact Bob Nease at *rfnease@msn.com* or Paul Waite at (321) 638-4161.

The 3rd B-1B Reunion Luncheon will be held on Saturday, September 24, 2005 at the Golden Sails Hotel in Long Beach. Call Lee French at (562) 866-9435, Lynn Isomoto at (562) 496-5604 or Mary Finger at (562) 420-9093.

A Plane Ahead Of Its Time – The A3J/RA-5C Vigilante

by Erik Simonsen

In the postwar era, the US Navy became determined to acquire a nuclear strike capability, first with the North American AJ "Savage" and, then, with the Douglas A-3 "Skywarrior" bombers. Both were subsonic aircraft and with the rapid evolution of aircraft design, both became obsolete for the missions they were committed to accomplish.

In 1953, on their own initiative and using company funding, the Columbus Division of North American Aviation, began a program to build an advanced carrier-based nuclear-strike bomber. The development team was led by Frank G. Compton.

With Navy concurrence, the concept took shape as a twin-engine aircraft with advanced combat avionics, Mach 2 performance and a "linear bomb bay" which released the nuclear weapon out the tail to give the aircraft less exposure to the atomic blast.

Given the go-ahead for two prototypes in mid-1956, the first prototype designated as the "YA3J-1 Vigilante" was rolled out on May 16, 1958. With North American chief test pilot Dick Wenzell at the controls, first flight was successfully accomplished on August 31, 1958, ushering in an array of new performance enhancements.

The Vigilante was long and sleek, with a relatively small high-mounted swept-back wing, and all-moving slab horizontal and vertical tailplanes. The tricycle landing gear, had single wheels for all three gears which retracted forward, the main gear rotating 90° before retracting into the wheel wells in the fuselage.

A large aircraft, the Vigilante weighed 80,000 lb fully loaded, had a wingspan of 53 ft and a fuselage length of 75 ft. Yet size proved no hindrance to performance, as the aircraft routinely approached target areas at 900 mph and had a top egress speed of 1,385 mph. On December 13, 1960, during carrier trials, Navy test pilots Commander Leroy Heath and Lieutenant Larry Monroe took their Vigilante to Mach 2.1, then nosed the plane up to a record of 91,451 ft.

The aircraft achieved good low speed landing performance through the use of large flaps. The ailerons were eliminated to make room for the flaps with roll control provided by differential movement of the horizontal tailplanes and an innovative scheme of spoilers on the wing leading edge and small "deflector" flaps near the trailing edge. A boundary layer control (BLC) system was incorporated in which air bled from the engines was automatically blown over the flaps when they were extended in order to lower landing speed.

Other new technologies included wing skins of aluminum-lithium alloy, critical structure made of titanium, variable engine inlets, a windshield of stretched acrylics, and a retractable in-air refueling probe. The two crewmen flew in tandem cockpits with individual "clamshell" canopies, seated in NAA HS-1 rocket-boosted ejection seats.

The Vigilante had the advanced Autonetics "AN/ASB-12 Bomb Directing Set" which included: a pivoting multi-mode radar; a radar computer with the Pilot's Projected Display Indicator (PPDI) one of the first "head-up" displays; a TV camera under the nose for daylight target sighting; a Radar-Equipped Inertial Navigation System (REINS), based on technologies developed on the Navaho program; and one of the first solid state computer systems, a digital computer system designated as the Versatile Digital Analyser (VERDAN) which would be later referred to as a "Very Effective Replacement for a Dumb-Ass Navigator". The Vigilante was one of the first aircraft to have a "fly by wire" flight control systems.

The first production A3J-1 Vigilantes were originally powered by twin General Electric YJ79-GE-2 engines, with engine bays made mostly of titanium and covered with gold film to reflect heat. The airplane had a large fuel capacity which provided long range and extended flight in afterburner. Subsequent production aircraft were fitted with more powerful engines leading to the J79-GE-10 with 17,860 lb afterburning thrust.



Photo courtesy of the Boeing History Archives Office

A high speed run being conducted by RA-5C Vigilante, BuAer Aircraft No. 149276, assigned to the carrier U.S.S. John F. Kennedy.



Photo from the Erik Simonsen Collection

Two RA-5C Vigilantes from RVAH-3 operating over the Pacific. The aircraft was capable operating at Mach 2 and 52,000 ft altitude, and could relay real time reconnaissance data back to the carrier.

Deliveries of the A3J-1 to operational carrier units began in 1961 with the final deliveries in 1963. Due to the Defense Department decision to use a common designation scheme for all military aircraft, the airplane was redesignated as the A-5A. Changing strategies dictated that the Vigilante's value would be better realized in a reconnaissance role. Thus, after building 66 A3Js, North American delivered the remaining 79 aircraft as RA-5C reconnaissance aircraft. In addition, 43 of the A3Js were converted to the RA-5C configuration.

The RA-5C incorporated all the new features of the A-5B including the humpback fuselage, the big flaps and the leading edge BLC. However, it also introduced a suite of reconnaissance gear that was state-of-the-art for the time. The TV camera under the nose became part of the reconnaissance gear, most of it was carried in a long slender "canoe" on the bottom of the fuselage that ran from the nose gear towards the tail.

The reconnaissance gear included, from front to rear:

- The KA-51A/B forward-looking oblique angle optical camera.
- The KA-50A, KA-51A or KA-62A vertical optical camera.
- Passive electronics countermeasures (PECM) antenna for the AN/ALQ-61 Electronics Reconnaissance System. The AN/ALQ-61 was an electronic intelligence (ELINT) system that would pick up radar emissions and pin down their coordinates, frequency, and pulse pattern. This data was recorded on magnetic tape for up to 112 minutes of continuous observation.
- Various panoramic, vertical and oblique optical cameras.
- An AN/AAS-21 infrared sensor which could provide a continuous film strip of thermal targets over a field of view 140° wide.
- Antenna for the Westinghouse AN/APD-7 side looking airborne radar (SLAR) system.
- Another PECM for the AN/ALQ-21 system.

The RA-5C saw combat in Southeast Asia from June 1964 through January 1973, serving with distinction while providing all-weather carrier-based tactical reconnaissance. Although conceived during the 1950s, the Vigilante's superb design and innovative engineering enabled the only Mach 2 bomber/reconnaissance aircraft operating aboard aircraft carriers to remain active for 21 years until its retirement in 1979.

A total of 156 Vigilantes were built, including prototypes.

North American proposed advanced versions of the Vigilante to the USAF as interceptors. One, known as the "Retaliator", added a liquid fuel rocket engine to the two J79s, but the Air Force did not pursue the concept. Later, in 1972, in response to an Air Force requirement for an advanced interceptor, North American proposed adding a third J79 engine in the center bay and arming the "NR-349", as the new aircraft was designated, with six AIM-54 Phoenix air-to-air missiles. The Air Force did not respond to that concept either.

About the Author: Erik is one of our most prolific authors with his splendid series of concise "Peek at the Past" articles about NAA/Rockwell aircraft. He is the communications manager for Boeing Air Force Systems. He is also a member of the Boeing History Council tasked with the preservation of the history of the Heritage Boeing companies. He is an avid aviation photographer and has authored two aviation books.

Tough Mission— Tough Plane—Tough Pilot

Eighteen RA-5Cs were lost in combat during the Vietnam War, providing the highest loss rate of any Navy aircraft in that conflict. The loss rate was high because the missions were unusually hazardous. Vigilantes were used for both pre-strike and post-strike reconnaissance. Pre-strike runs were relatively safe, but the North Vietnamese quickly realized that after a target was bombed, a reconnaissance aircraft would soon follow to evaluate the damage. So post-strike missions were generally conducted in the face of an enemy that was thoroughly alert and waiting. The Vigilantes flying these missions tried to follow the strike elements just after the last bombs fell to reduce the risk.

Only nine of the 36 men shot down were rescued. In one case, the rescue became almost surreal. Lieutenant JG Francis Prendergast was the back-seat RAN on an RA-5C shot down over North Vietnam on March 9, 1967. He was captured near the seashore by North Vietnamese militiamen with two of them assigned to guard him. One was armed with a rifle, the other with Prendergast's own .38-caliber revolver, standard equipment for aircrews and carried externally in a shoulder holster.

Prendergast carried the revolver with the first two chambers unloaded as a safety measure, and, as a back-up, he had a small .22 caliber automatic pistol hidden inside his flight suit. When a rescue helicopter and support aircraft showed up, strafing drove off all the North Vietnamese except the two guards, who felt safer staying with Prendergast rather than running for cover.

This proved to be a fatal error! While the two North Vietnamese were distracted by the noise and confusion, Prendergast pulled out the little automatic, cocked it and shot the militiaman with the rifle in the head. The other militiaman tried to shoot Prendergast with his revolver, only to find that the hammer fell on an empty chamber, and he was shot an instant later. Prendergast then swam out to the rescue helicopter and was safely retrieved.

Flying The F-100 Super Sabre With The Thunderbirds

by Major General Gerald D. Larson, USAF (Ret.)

Thinking back to my F-100 flying years with the Air Force, I find it easy to fill pages with the good memories of purely enjoyable hours in the cockpit doing the job the Super Sabre was designed to do—perform the tactical mission as planned. However, the early operational period of the F-100 was difficult and missions rarely went as planned—if at all!

Constant speed drives, burner pigtails, fuel controls, anti-skid brakes, nose wheel steering, etc. were systems that seemed prone to failure. Logistics support hadn't caught up, spare parts were generally not available and maintenance experience was limited. Bob Tedford, our NAA Rep, worked long and hard to train and coordinate support for our F-100s. In time, over many months, supplies improved and component failures were analyzed and corrected.

Accumulation of flying time for us lieutenants, though, was frustratingly s-l-o-w. But the combination of scheduled training sorties, factory ferry flights, weekend cross countries, squadron deployment and aircraft deliveries to Europe brought my time up to a relatively respectable level.

About this time, I decided to apply for a position with the Air Force Demonstration Team—*The Thunderbirds*—definitely, a long shot. There never was a more surprised pilot in the Air Force than I when I was asked by the Team Leader to come to Nellis AFB for a tryout. My luck held and I was selected to replace the next departing Thunderbird pilot-the solo performer. What a great opportunity: a special mission, great flying and exceptional support.

The Thunderbird Team had transitioned to the F-100C in 1956. June of that year marked the last of the Team's F-84F airshow days and the arrival of the first Super Sabre. The bird was an excellent choice. It was big, noisy, maneuverable, supersonic and beautiful. Crowds loved it! The 1956 airshow schedule provided just over thirty days for the Team to transition to the new bird and resume airshows on the road. A high priority for parts and people was afforded the Team and the transition, generally, went as planned. Pilots and maintenance personnel quickly learned all about their new machine and, as 1956 ended, forty-eight official airshows had been performed.

The Super Sabre was well established with the Thunderbirds when I joined them in 1960, and their F-100Cs were the highest time flyers in the tactical force. My airplane, A/C No. 52723, and the Leader's, A/C No. 52748, hit the 2,100 hour mark in 1961. Jim (Sam) Stuart, our NAA Tech Rep and Jim Lewis, our NAA Maintenance Technician, as well as the dedicated Thunderbird maintenance cadre were tireless in their efforts to keep our six airplanes in commission. No airshow was ever cancelled due to failure of aircraft maintenance.

In 1960-1962, it was a unique experience for me to participate in over 200 airshows throughout the U.S.A., Central, and South America. Our F-100Cs were retrofitted with air refueling capability which allowed us to work a tight deployment schedule and bring the F-100 demonstrations to places not previously available.



Photo courtesy of the Boeing History Archives Office

So close is the precision and coordination of the Thunderbirds that the four-plane formation moves through a series of close maneuvers as if they were one airplane. While flying demonstration flights around the world, the Thunderbirds are stationed at Nellis Air Force Base in Nevada.



Photo from the General Larson Collection

The solo Thunderbird makes a very slo-o-ow pass in front of the crowd with everything extended to serve as a brake.

Staging from Guatemala and supported by a KC-97 tanker, the Team performed at Managua, Nicaragua and Tegucigalpa, Honduras-sites where jet fighters had never flown. Undoubtedly, the most demanding airshows were performed at La Paz, Bolivia and Quito, Ecuador where show altitudes were at 13,000 to 17,000 feet. The afterburners got a hard workout in those shows but the airplanes performed flawlessly and the spectators were mesmerized by the noise, smoke and precision flying.

Crowd control at Quito was non-existent. After the show started, the people surged onto the runway to get closer to the action—a very bad situation as five Thunderbirds with minimum fuel at the completion of the show had to land! There was no alternate runways for recovery, it was land at the main Quito runway—now covered with eager spectators-or bail out. Finally and only after a low, s-l-o-w, gear down pass with plenty of smoke; the crowd moved off the runway and we could land. Our Goodwill Mission was still intact and all the Thunderbirds were relieved.

In Paraguay, President Stroessner requested that we demonstrate the F-100 supersonic capability. We resisted the supersonic demonstration, cautioning the Presidente and his staff that there may be structural damage and broken windows in the surrounding area but he persisted. He announced on national radio that the event would take place. I opened the show with a sonic boom, followed by a supersonic pass! The Presidente was delighted and we never heard if there was any damage.

In 1964, after eight years and 641 stellar airshows, the F-100C was replaced by the Republic Aviation F-105B. However, after performing only six airshows, it was decided that the Thunderbirds, now the 4520th Air Demonstration Squadron, should return to the F-100D—the workhorse of the tactical forces. Four more years of great performances by the Super Sabre made the airplane truly a Super Star. A total of thirteen years of service, 1,111 airshows and an entire gamut of tactical mission successes created a whole new legacy for North American Aviation.

With well deserved recognition, Dutch Kindelberger, Lee Atwood, Ray Rice, Alex Burton, John Casey, Bob Hoover, Jim (Sam) Stuart and Jim Lewis were awarded the distinction of becoming Honorary Thunderbird Squadron members.

Today, the Squadron, now equipped with F-16s, continues to demonstrate the latest and best equipment-undeniably meeting the high standards set by the great NAA F-100 Super Sabre.

About the Author: Readers will recall the splendid article in the Spring 2004 Issue provided by Major General Larson about his initial encounter with the F-100. A command pilot with more than 6,700 flying hours and 235 combat missions; his decorations and awards include the Silver Star, Legion of Merit, Distinguished Flying Cross, Meritorious Service Medal and the Air Force Commendation Medal. He and his charming wife are currently retired in Woodbridge, VA.

Space Shuttle: A Fitting Climax To A Glorious History

by Dr. John B. Peller, Ph.D.

The Shuttle and Us

The history of North American Aviation, our history, is unparalleled in the field of aerospace. That history continued when we became part of Rockwell, and it continues today under Boeing.

All of us can recall with pride the extraordinary aircraft designed and built by NAA. And, without skipping a beat, NAA was also a leading pioneer as we moved into Space.

We built the most and the best liquid rocket engines in the business. We were in the forefront of the cruise missile field with the Navajo and, later, the Hound Dog. We built the second stage of the Saturn V launch vehicle (and all of the Saturn V rocket engines) that took men to the moon, and we built the Apollo space capsule that carried them. We originated the guidance systems for the Minuteman Intercontinental Ballistic Missile and the nuclear submarines that navigated under the Arctic ice cap. And we did much more.

No other company can claim such a broadband of leadership in the field of aerospace, and we are proud of that.

In a way, the Space Shuttle is a fitting climax to this wonderful history... It is an *airplane*, one that flies from Mach 25 down to Mach 0.25, a dynamic range greater than any other aircraft (by a huge factor). It is a *rocket* that can carry unprecedented payloads into orbit. It is a *spacecraft* that has no equal. It can maneuver in orbit, rendezvous with other spacecraft, dock with the Space Station and *practically dance on the head of a pin*. The Shuttle today still has no equal—there isn't even a distant second in this competition.

But we didn't get there with ease; it was a very difficult task that required us to use all of the aerospace expertise that our company had. Numerous daunting challenges had to be addressed. Many technological issues had to be solved with new inventions that were actually scheduled, not merely hoped for. Because we had a great team drawn from every element of the company, we were able to design, develop and produce this magnificent vehicle.

This article is the story of just a few of those challenges that had to be addressed. There were many others which won't be covered here because they have been discussed many times in other articles elsewhere or will simply have to wait for another opportunity to be told.

Flying Into Space With Wings

Rockets don't have wings. The Shuttle didn't need wings on the uphill part of the ride. But the only way to have them available for the return was to take them with us on the way up. We certainly didn't need the lift they generated. In fact, that lift was a major problem. With all of that rocket power, the Shuttle gets going very fast while still in the atmosphere. This causes the wings to generate immense lift. Unfortunately, that lift is orthogonal to the direction in which it would be useful and is simply stressing the wings to their limits. If we didn't resolve this issue, the lift could even stress them beyond their limits.

We had to do something to reduce these immense forces, and the answer was to fly the ascent with a negative angle of attack. When you see the Shuttle ascend, you see the Shuttle roll over on its back and then fly with a noticeable negative angle of attack. It rolls over on its back to give the astronauts a visible reference point for their attitude, but it also flies the negative angle of attack to help reduce the lifting forces that threaten to break the wings.

As you fly greater negative angles of attack, you increase the aerodynamic loads on the top of the crew module. The negative angle of attack has to balance the requirement to reduce the lifting forces on the wing while not collapsing the top of the crew module. Winds at altitude also affect the angle of attack, and even with balloon launches prior to a Shuttle launch, significant uncertainties remained and these had to be taken into account.

In hindsight, we were fortunate that a solution existed for all of these constraints. The more than one hundred flights completed have proven the effectiveness of the solution.



NASA Photo

On April 12, 1981, the Space Shuttle COLUMBIA became the first shuttle to orbit the Earth. Flown by Commander John W. Young and Pilot Robert L. Crippen, the flight was designated as STS-1 and was aloft for two days.

Hypersonic Flight of Re-Entry

Most airplanes test their flight envelope by starting slow and low and progressively going higher and faster. Shuttle started at the opposite corner of the flight envelope: Mach 25 and 400,000 feet altitude. This put a premium on the ability to predict the aerodynamic characteristics of the vehicle before the first flight.

Of course, there are no Mach 25 wind tunnels, so a lot of extrapolations had to be done to generate the necessary data. The aero people did an exemplary job under trying circumstances, and we got very few surprises on the first flight, and none of any serious consequence.

To understand some of the difficulties of this, realize that Shuttle flies most of the entry phase at an angle of attack of 40 degrees. Flying hypersonically at this angle of attack was way outside of the experience base. The Shuttle also has to transition from controlling its attitude like a spacecraft with reaction control jets to using the elevons and rudder for control.

As the aerodynamic forces started to build on re-entry, pitch and roll controls were switched to the aerosurfaces. But lateral control was very difficult. The high angle of attack reduced the effectiveness of the rudder and the elevons. This was complicated by the fact that the hypersonic speeds caused significant uncertainties in the aerodynamics. Given that the vehicle was deliberately designed to be either aerodynamically neutral or unstable, this posed a major problem.

All of these factors made a reliable solution very elusive. The challenge brought back notable NAA players from the past, including Harrison Storms and Charlie Feltz; even Lee Atwood took a look at the problem. Only with the combination of very capable control engineers and very extensive and hard work, over several years, was a solution found. The effectiveness of that solution has now been demonstrated over a hundred times.

Landing a "Brick" Dead-Stick

The hypersonic phase of entry was challenging enough, but we also had to figure out how to land a low lift/drag (L/D) vehicle routinely in a dead-stick landing. In the final flare maneuver, the L/D of the vehicle was only about 4. Because of the operation of the computers in the flight control system, controlling the Shuttle during most of the flight is very easy. No matter what the dynamic pressures are, the vehicle responds the same way. The exception is when the vehicle nears the runway. Landing an unpowered "brick" is a challenge, and a lot of effort went into finding both a design and piloting techniques that would permit this to be done reliably.

The degree of difficulty is illustrated by two flight test events. On the last flight from the back of the 747, we experienced a pilot-induced-oscillation (PIO) near touchdown (the term PIO is misleading-the pilot was involved, but did not induce it; the system induced it). On the third orbital test flight, we landed at White Sands at much higher speed than



Photo from the Ed Rusinek Collection

On March 30, 1982, Space Shuttle COLUMBIA, completing the third shuttle mission, STS-3, was redirected due to extremely wet conditions at Edwards Air Force Base to land on Runway 17, Northrup Strip, White Sands, N.M. During the landing, the crew, Commander Jack R. Lousma and Pilot C. Gordon Fullerton, encountered some tendencies by the orbiter to do "wheelies".

normal. When the Commander attempted to slow the rate of rotation for nose gear touchdown, the vehicle performed a "wheelie" and almost took off again. Keep in mind that we had some of the best pilots in the world, but the landing challenge took a while to master.

Digital Fly-By-Wire

Contrary to all operational aircraft at the time, the Shuttle had no cables linking the control sticks to the aerosurfaces. Instead, the control sticks were connected to the computers, which processed the control stick inputs and turn them into commands to the hydraulic actuators that drive the control surfaces. This really alarmed some of the early astronauts, and a number of them wanted to be able to control the aerosurfaces directly. There was no way they could manhandle the large surfaces, and because the vehicle was statically unstable or neutrally stable, there was really no chance of them controlling the vehicle without the assistance of the computers.

We tried to tell them this, but in the end, we had to prove it to them by letting them try to fly the simulators in the so-called Manual Direct mode, in which the computers simply sent the control stick position to the aerosurfaces without changing its value to account for vehicle angular rates, accelerations, etc. Nobody could fly the vehicle in this manner, and they finally accepted the digital fly-by-wire approach.

Getting the astronauts to agree to this was one thing; making it work reliably was another. What if the computer failed? Would the vehicle spin out of control? The answer is "Yes", if we only had one computer controlling the vehicle. We actually used four computers, all doing identical calculations, and "voted" the computer outputs at the hydraulic actuators. In this way, we could have two computers fail and still have full control of the vehicle.

What if the software crashed? We see this all of the time in our PC's and other computers. Would this take down all four computers simultaneously? The answer is "Yes". To protect against this, we used a two-pronged solution. One was an extremely demanding test program to find causes of computer crashes and eliminate them. While this was well done, nobody could guarantee that a computer crash would never occur.

So we implemented the second of our two-prong approach: a fifth computer which backed up the first four computers with independently coded and tested software. The success of the first prong of our approach is evidenced by the fact that the primary system has never crashed in flight, but the backup is still maintained in the system just in case that one in a thousand or one in a million event should occur.

Lift-Off Without Breaking Anything

Most rocket vehicles have a lot of symmetry in their configuration. Most are essentially cylinders with the rocket engines producing thrust which is centered between the hold-down points. However, Shuttle is highly asymmetrical. The three liquid propellant rocket engines on the back of the Orbiter are not located like a standard rocket. They start their ignition sequence first. It takes about three seconds for them to come up to full thrust and stabilize.

Normally we would then command the mammoth solid rocket boosters to fire and we would have lift-off. However, while the liquid rocket engines on the Orbiter have been coming up to thrust, the asymmetrical location of their thrust vectors have caused the entire stack to bend. The front of the vehicle actually moves several feet, and this is very obvious if you observe the movement of the tip of the External Tank during this time.

When bent like this, a lot of things are highly stressed, and if we ignited the solid rockets at this time of maximum distortion, a lot of things might break. So we have to wait another three seconds while the vehicle oscillates back to its initial position. During this time, we are using a lot of propellant and not getting anything out of it at all, other than a lot of steam coming out of the flame bucket. A lot of engineering went into getting this sequence just right, and it has worked perfectly every time.

Conclusion

In this brief article, I have tried to convey some of the Shuttle challenges that have not been covered numerous times in other venues. This does not imply that these were the most difficult tasks. Consider, for example, the tremendous challenges of the thermal protection system. Shuttle not only must survive re-entry, but be able to fly again within a relatively short time.

Today, there are many suggestions for how to get into Space cheaply and easily. None of these proposals address the daunting payload and performance problems that Shuttle had to address. One or more of these alternative efforts may eventually succeed, although at a much higher cost and longer schedule than now suggested. When they do, they will have built their success on the shoulders of giants, and many of the readers of this article are those giants.

Prologue

This article was written prior to the recent return to flight of the Space Shuttle Discovery. At the time of this writing, the Orbiter is performing splendidly, and by the time you read this, I believe the Discovery and its crew will have safely returned to Earth.

Although two Orbiter vehicles have been lost, we should note that in both cases, the Orbiter was the victim of problems external to the Orbiter. The Orbiter continues to be a magnificent vehicle.

About the Author: Dr. Peller retired in 2002 as a Vice President of Boeing after a 41-year career with Boeing and its predecessor organizations. He graduated from Rensselaer Polytechnic Institute and came to work for the Autonetics Division of North American Aviation. He later received a MS and PhD from UCLA.

During his career, he led the conceptual design of the Minuteman III front end which became the nation's first land-based Multiple Independently Targeted Re-entry Vehicle ballistic missile. He worked on the Shuttle program for over 13 years, completing his Shuttle assignments as Vice President of Engineering for Space Division.

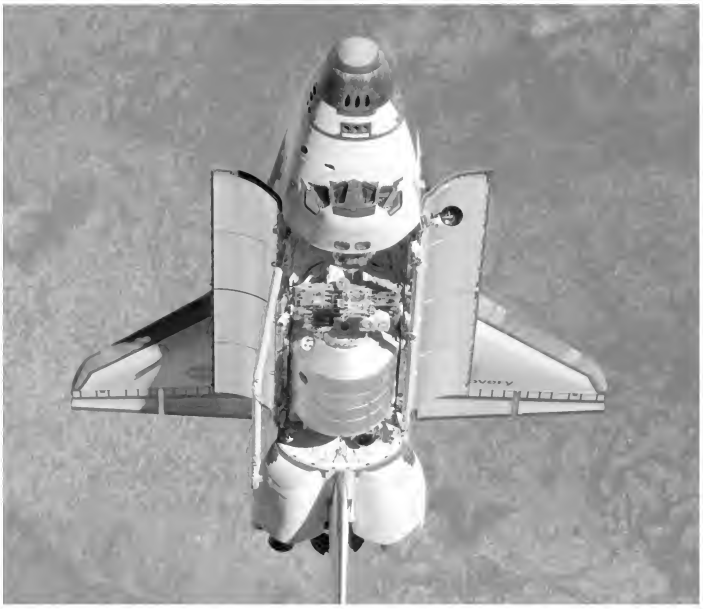
He also led the capture teams for the successful proposals on National Missile Defense and the Army's Future Combat System. He led the industrial team working the National Missile Defense Program for the first two-plus years after we won it. He continues to support Boeing in a consulting role. Dr. Peller resides in La Habra Heights, CA with his charming wife Pat.

STS-114 – Return to Flight

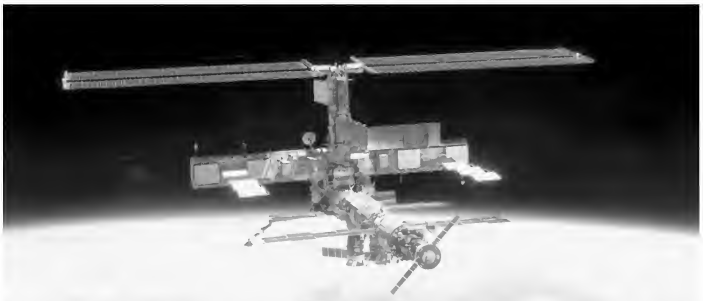
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Letters of an Apprentice

Inglewood, California,
June, 1939.

Dear Mom:

I'm not sure as I write this, whether I am alive, dead, sane or insane; such a week. That "inflated ego" you so often accused me of, is cured, permanently cured, deflated in one week.

My first day at the shop was like the old school exams, where, after weeks of cramming, the questions asked were only the ones I had not studied. So here, all the Theory of Flight, Stress, Alignment, Engines, Wood, Wire and Dope (that's me) of the past five years is a total loss. I came out here to show these backwoods Westerners a thing or two and are they laughing? And how! I reported for work full of confidence and that "Watch me show you" attitude, it didn't last long.

They took me into the shop and introduced me to the foreman of the dept. I was to work in and he in turn took me to the lead man (straw-boss), who is my immediate superior. After asking a few questions as to experience, etc., the lead man took me over and left me standing in front of a jig. It looked like a guillotine to me at the moment.

On this jig was assembled an assortment of parts of different shapes and sizes, joined together by a single sheet of aluminum held by screws. The lead man returned with a hose, a do-jigger he called a gun, and several pieces of steel rod, called sets. With the admonition to "Go to work on it," the lead man left me standing in a daze. It might have been DAYS but for the noise that finally filtered in and broke my state of coma.

Condemned men walking that famous last mile must be in an ecstatic frame of mind compared to me as I finally awoke to the fact that I had bluffed my way into a job that I knew absolutely nothing about. I had never seen a rivet, gun, jig, etc. And I knew of no appropriate prayer. I was afraid that if I confessed to the lead man I would be promptly fired, so, instead, I went to work, and how! Five more like me, and the company would have gone bankrupt in a month.

The first incident in my career in aviation happened as I stood wondering what to do. I was nervously fingering the gun and it went off without aim or warning, sending the set slamming into the sheet of aluminum and denting same. I consoled myself with the thought that it might have been worse — I might have aimed. As I looked around guiltily, I caught the eye of the man on the next jig. I don't know what he saw there, but he hurried over and as I mumbled something to him, tried to tell me what to do. But he might as well have been talking Latin. I only caught a few words, "Drill 30 holes, ream 21 for 5/32 rivets," and away he went. I stood wondering why I should drill 30 holes if I was only to use 21 of them, and what size should I drill them, 4/32 or 9/64 — or maybe 3/16?

A man from another jig came over to me at this time and not only explained that 30 and 21 were drill sizes, etc., but showed me how to work. The idea seemed simple as he explained it. Just drill the proper size holes for the rivets, insert the rivet, hold the gun with proper set against the head of the rivet with one hand while you hold a heavy steel bar against the other end of the rivet with the other hand, and brrp—brrp, it's done. All went well till I pressed the button — the bar vibrated so hard that my fingers were jammed against the metal in back, causing me to drop the bar while the gun and set ran off with my other hand, hippity-hop, all over the sheet. From then on I gradually improved. I got so I could stay on the rivet at both ends, and did, until the rivet merged with the metal invisibly. I also discovered that while using a 5/32 round heat set on brazier head rivets might improve the looks to my satisfaction, the company didn't care about it particularly.

After lunch the lead man evidently decided that I could do badly better with some less expensive practice, so he stuck me off in a corner, away from all harm (to others) and let me practice the rest of the day.

Well, it's bed time, and I've found that proper sleep is all-important, so I'm for getting it. Please ask Daisy to send me some of that money that I gave her before I left. It's two weeks till pay-day, and I was broke when I started to work, and in order to work to eat, I've got to eat to work.

Love to all,
Your devoted son,
KIM.

NORTH AMERICAN LOG

Contrails From The Past

by Ed Rusinek

Dear Ed,

With the rapid disappearance of the Downey facility to the bulldozers of the movie studios, I would like to lay claim to being the first of us to set foot on Vultee Field. My uncle, Ray Root, had taken a job with Consolidated around 1942. He was returning home to Michigan from a business trip to Vultee when the DC-3 on which he was a passenger was struck by a flock of geese. The pilots were either killed or incapacitated and the plane crashed. I was there with the rest of the families when they scattered his ashes over Vultee Field.

—Boyd Beckner, Grass Valley, CA

Ed's Resp.: Watching that historical site being transformed into another shopping mall, I hope Uncle Ray Root comes back and haunts the place!

ATTENTION F-86 AFICIONADOS

The SabreJet Classics Magazine, a publication of the F-86 Sabre Pilots Association, is now available to our readers. The group is composed of USAF Sabre pilots that have served in the Korean War. The magazine contains their personal stories of combat against the MiG-15s over the Yalu River. If you love the F-86, and who doesn't, this is the magazine to get. The cost is $15.00 per year. Please send your checks to:

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The Silent Majority

by Stan Guzy

ARMSTRONG, WELDON T. "TOM", 77 - of Sedona, AZ, died of heart disease on June 21, 2005 at Gold Beach, OR. A fighter pilot during the Korean War, he became an experimental test pilot and accident investigation officer at Edwards AFB, where he completed seven test programs on the "Century Series" fighters, including the F-100, F-101, F-102, F-104 and F-106 and the T-38 and U-2. He joined NAA in 1963 as chief research pilot on the Apollo Lunar Landing program where he developed the initial Apollo/Lunar Landing docking flight procedures. From 1981 until 1997, Tom served as research pilot and systems safety engineer on the Space Shuttle Orbiter program. His wife Joan survives him.

AARON, ROBERT H., 94 - died on July 18, 2005 at his home in Laguna Woods, CA, after a brief illness. He was extremely proud of his role as an NAA/RI contract manager on Space Programs, including the Apollo XI mission to the Moon, and later on the Space Shuttle. Bob retired from NAA/RI in 1975.

BATES, RICHARD W., 84 - of Lake Forest, CA died of a gastric hemorrhage on June 21, 2005. He was a retired purchasing agent for NAA/RI.

CAVANAUGH, JACK D., 83 - died on June 12, 2005 in a hospital in Las Vegas, NV as a result of a staph infection acquired while recuperating from a fall. Jack was in the Traffic Department at LAD and Autonetics. He retired in 1979 after 32 years of service.

CHRISTOPHER, FRANK J., 79 - died on July 5, 2005 in Orange, CA of congestive heart failure brought on by mesothelioma. Frank worked in the Finance group at Autonetics and at Corporate before retiring in 1987 after 23 years of service. He was a member of the NAA Bald Eagles. He is survived by his devoted wife of 58 years, Shirley.

CROCKETT, ROBERT "BOB" JR., 79 - of Seal Beach, CA, passed away on June 12, 2005 from a fungal infection of the lungs. Bob served in manufacturing productivity for 42 years in Downey before retiring in 1988. A colonel in the Confederate Air Force, he was the post advisor for the Explorer Scout Post for Space Exploration at the Downey facility. Bob is survived by his caring wife of 54 years, Joyce.

CULLETON, RICHARD P., 82 - passed away on August 4, 2005 in Lancaster, CA of cancer. Dick first retired from LAD in 1978 but returned to Palmdale and EAFB as a structures engineering manager and retired a second time in 1987 with 31 years of service. He worked on the F-86, XB-70, RA-5C, and the B-1.

DODGE, EUGENE R. "GENE", 85 - passed away on August 12, 2005 of heart failure in San Jose, CA. Gene was a metallurgist for many years in the LAD Production Development Laboratory.

DUNHAM, PHILIP N. "PHIL", 84 - passed away at his home in Dewey, AZ on March 29, 2005 after a long illness. After a twenty-year career in the Air Force, Phil obtained an engineering degree and joined the Space Program. He worked on the Apollo, Shuttle and GPS programs. Taking evening classes at law school, he passed the California Bar and became an engineer-attorney. Phil retired from Rockwell International in 1982. His family moved to Arizona and he was appointed a Municipal Judge for Prescott Valley. His loving wife Marjorie survives him. Phil was buried with full military honors Riverside National Cemetery in Riverside, CA.

DUNN, JAMES, 74 - died on July 29, 2005 in Orange, CA from cancer. He had worked as an engineer at NAA/RI before retiring.

ELBEN, ANN R., 82 - of Rancho Santa Margarita, CA died of heart disease on June 30, 2005. She was a senior instrument inspector for NAA/RI before retiring.

FEASTER, THOMAS W., 70 - passed away July 28, 2005 at his home in Sun City, CA of undisclosed causes. Tom was a member of the Apollo Space Program team at NAA/RI with 36 years of service. He is survived by his beloved wife of 49 years, Margie.

FILKOFF, HERBERT L., 80 - died of renal failure on July 4, 2005 in Fountain Valley, CA. He was a aerospace engineer at NAA/RI before retiring.

FORE, WALLACE E., 87 - died on June 9, 2005 at Air Force Village West in Riverside, CA. He joined NAA in 1938 while attending USC. He was called to active duty in 1941 and served in Europe. After the war, he returned to NAA and to USC where he received his B.S. degree. He subsequently received an M.S. degree from UCLA. During his 43-year career, he served as vice president of several divisions including Rocketdyne, Rockwell Aircraft and Space Operations. He retired from Rockwell in 1980 as Vice President of Production Operations.

GALLEGOS, GEORGE H., 88 - passed away peacefully on June 7, 2005. He had worked at NAA/RI and NASA on the Skylab and Space Shuttle projects, receiving a NASA award for his time saving ideas. His beloved wife, Bebe, survives him.

GIAVANNOLI, WILLIAM F., 85 - of Laguna Beach, CA passed away on July 3, 2005. He was an NAA/RI engineer.

HAND, WILLIAM H. "BILL", 90 - of Laguna Woods, CA died on February 23, 2005. Bill retired from LAD B-1 Division in 1975 after 36 years of service. He was proudest of his contribution to the success of the P-51. His caring wife Ann survives him.

HANSON, ARGIE, 63 - passed away on May 27, 2005 in Dana Point, CA. She had worked in the aerospace industry for over 28 years and at NAA/RI before retiring.

HEDEGUS, ALEX, 87 - died of natural causes on May 20, 2005. Alex had a 36-year career in the Traffic Department at LAD, Downey and Anaheim as a truck driver, dispatcher and supervisor. He is survived by his wife of 40 years, LaVonne.

JAMES, EARL A., 64 - passed away in July 2005 of undisclosed causes. He retired from NAA/Boeing after 36 years of service beginning at the Downey Facility and culminating at the Anaheim Facility in 1997. He had received many performance commendations from NAA/RI and the Navy.

JOHNSON, JIM R., 73 - died of a heart attack on February 7, 2004 at his home in Chatsworth, CA. Jim was a chemical engineer for 36 years at Rocketdyne until he retired in 1990. His loving wife Lavonne survives him.

JORGENSEN, BETTY, 84 - of San Antonio, TX passed away on May 4, 2005 at the Air Force Village II. She was a long time employee of North American Rockwell Corporation.

KOKEN, GENE, 91 - of Lakewood, CA, died on June 20, 2005 from complications of old age. Gene worked in Material at LAD and Autonetics, serving for 35 years before retiring in 1977.

KRAUSMAN, HELENA M., 91 - of Fullerton, CA died of natural causes on June 30, 2005. She worked as a senior statistician at NAA/RI for many years and for the editor in the Apollo Logistics Administration group for several years.

LEEVER, WILLIAM E. "BILL", 80 - died June 20, 2005 of heart failure. Bill joined NAA/Autonetics on the Minuteman Program in 1960. After initially working in flight test analysis, he became involved in the cryptographic aspects of nuclear command and control. He was regarded as the father of the Minuteman code handling system. Bill retired in 1990, shortly before the death of his wife, Marge.

LE GENDRE, RICHARD, 69 – of Norco, CA died July 20, 2005 of injuries suffered in an accident. He was a retired lab technician from NAA/RI.

LEONE, LEO, 83 – died August 4, 2005 in Laguna Woods, CA of congestive heart failure. He had retired from tooling liaison at NAA/RI. His wife Mary survives him.

LINDSAY ROBERT "BOB" – passed away peacefully at his home in Buena Park, CA in July 2005. He had worked in the Central Contacts/Pricing group at the Sabreliner Division and at the Autonetics facility.

LITTLE, NORMAN H., 86 – of Rancho Santa Margarita, CA died of pneumonia on July 12, 2005. He had been an engineering manager at NAA/RI.

LUCAS, CHARLES "CHUCK" – died on April 11, 2005 in Slidell, LA as a result of congestive heart failure and complications of diabetes. He started at Curtiss Wright and the Columbus Division. In 1953, he became a tech rep at LAD, working on the F-86 and the F-100. His wife Anna survives him.

MACTAVISH, DUNCAN F., 87 – living in Oceanside, CA for the last 23 years, died of natural causes on June 17, 2005. He came to work at NAA in 1946 as an electrician and retired after 30 years of dedicated service. He is survived by his wife of 64 years, Irene.

MCCABE, STEPHEN J. 86 – passed away on January 14, 2005 of cancer. He joined LAD in 1952 in the Materials and Processing Lab and moved to the Dynamic Test Group working on the F-86 and F-100. He later transferred to Downey and had similar assignments on the Apollo and S-II. Stephen retired to Coeur d'Alene, ID in 1976.

MCLEOD, JAMES, 77 – passed away from a stroke in Newport Beach, CA on May 24, 2005. Jim began his career with NAA/RI in 1958 at the Downey Facility in Autonetics Manufacturing Cost Analysis. In the 1960s he transferred to the Contracts/Pricing function and held many Pricing managerial positions. He retired in 1995 after 37 years of service. His wife, Joan, survives him.

MOTE, RUSSELL W., 62 – passed away on May 28, 2005 at his home at Ryland Oasis in Menifee, CA from undisclosed causes. Russell was employed by NAA/RI/Boeing for forty years and retired as a Facilities manager in Plant Services.

PARLIER, SHIRLEY D., 81 – died May 9, 2005 of natural causes. Shirley worked in the Compensation group at Autonetics prior to her retirement after 25 years of service.

PAYNE, RAYMOND E., 76 – passed away in Paradise, CA on May 11, 2005. Ray started at NAA as a draftsman and advanced to design engineer, working on the Hound Dog, Apollo, Space Shuttle and the B-1B programs. A ten-year cancer survivor, he leaves behind his wife of 56 years, LaVerne.

PURKEY, LEWIS L. "BILL", 86 – of Shingle Springs, CA, died on June 15, 2005 of cancer. Bill came to NAA in 1942 and joined the Navy in 1944. He returned to NAA in 1946 in Flight Test and was transferred to Mojave. When the Palmdale facility opened, he moved there and stayed until he retired in 1964 with 23 years of service. Bill was involved in the testing of most models of NAA aircraft and helped demonstrate the Sabreliner in Europe. He will be buried in the National Cemetery in Phoenix, AZ. His devoted wife Delia survives him.

SCHIELD, PAUL E., 72 – passed away on June 7, 2005 in Santa Ana, CA of complications from Parkinson's disease. Paul worked as a welder at LAD, Space Division and Rocketdyne. He retired in 1996 after 43 years of service. His caring wife Ruth survives him.

SCOTT, ROBERT A., 88 – passed away in Tualatin, OR on July 16, 2005 from a heart attack. Bob retired in 1977 after 39 years of service. Among the projects he worked on were the P-51, B-70 and the Space Shuttle. He is survived by his beloved wife of 64 years, Ruth.

SECHRIST, WILMOUTH T. "BILL", 93 – of Mission Viejo, CA, died of congestive heart failure on May 21, 2005. Bill started at LAD in 1946 and served for 23 years before retiring in 1969. He worked on many programs at Edwards AFB and at the Palmdale facility.

SHEPHARD, NELL, 71 – died at home in Norwalk, CA on May 23, 2005 of cancer. Nell served for 28 years at NAA/Rockwell and was a supervisor in Material when she retired. Her devoted husband Ken survives her.

SHRIEVES, RICHARD H. "DICK", 87 – passed away on March 6, 2005 at Merritt Island, FL after a long illness. Dick worked for NAA/Rockwell at Eglin AFB and on the Saturn-Apollo program at KSC. His wife June survives him. She also worked at KSC.

SHULTZ, ALVY P., 89 – of Hawthorne, CA died on April 25, 2005. Alvy was an engineer at NAA/Rockwell for 38 years. Services were held in Colorado.

SPANGENBERG, MALVERN A. "BILL", 73 – died on June 10, 2005 in Placentia, CA of cardiopulmonary failure. Bill came to NAA/Autonetics in 1961 and worked in the Minuteman G&C Program. He managed several successful advanced engineering projects related to inertial guidance systems. He retired in 1993 after 32 years of service. His loving wife Florence survives him.

STONE, GARRETT M. "JIM", 84 – of Rancho Palos Verdes, CA passed away on May 7, 2005 after a 4-month struggle with congestive heart failure. After 42 years of service as an engineer, proposal manager, supervisor, he retired as the manager of the Low Speed and Trisonic Wind Tunnel at the El Segundo facility.

TALEVICH, WILLIAM J. "BILL", 86 – passed away on June 13, 2005 in Anaheim, CA of complications from Alzheimer's disease. An accomplished artist, musician and linguist, Bill joined NAA before Pearl Harbor as an assistant sheet metal worker and quickly advanced to foreman but was soon drafted into the Army Air Corps. After the war, he resumed his career at NAA and became an expert in engineering documentation. He retired from Defense Electronics in Anaheim in 1993 after 52 years of service. In life, Bill exemplified the values of patience, kindness, humility, humor and strength of character. His loving wife Susan survives him.

WEAVER, GEORGE, 82 – died at home in Bakersfield, CA on June 29, 2005 after a long battle with cancer. George retired from Autonetics in 1981 after 20 years of service as a logistics coordinator. He is survived by his devoted wife of 56 years, Frieda.

WIGGINS, WILLIAM R., 85 – passed away on June 6, 2005 in Torrance, CA of heart failure. Bill served for 19 years as a structures engineer at LAD, Space and Rocketdyne before retiring in 1985. He is survived by his beloved wife of 57 years, Alice.

WILLIAMS, WILBERT A., 78 – a retired computer analyst for NAA/RI, died February 9, 2005 of diabetes. His wife Rosetta survives him.

WITTE, NORBERT F. "BERT", 87 – died on July 12, 2005 at his Fullerton, CA home. He retired from NAA/RI as a director on the Shuttle Program in 1980. Bert is survived by his wife of 63 years, Helen Marie.

WOODS, RICHARD B., 74 – of Garden Grove, CA passed away on August 3, 2005 of undisclosed causes. He worked at NAA/RI for 30 years as an aerospace engineer before his retirement in 1988. He is survived by his devoted wife of 52 years, Millie.

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Photo courtesy of the Boeing History Archives Office

One of the last Navy Vigilantes, BuAer Aircraft No. 156640, completed at the Rockwell International Columbus facility shown taxiing out for takeoff. The RA-5C configuration included the humpback fuselage, providing a substantial increase in fuel capacity, longer and wider flaps and a new leading edge BLC system. The state-of-the-art reconnaissance gear, carried in the long slender "canoe" on the bottom of the fuselage, was controlled by the back-seater, who was designated as "Reconnaissance-Attack Navigator (RAN)". The aircraft bears the colors of Squadron RVAH-12, the "Speartips", assigned to the carrier U.S.S. Saratoga.

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION Retirees Bulletin

Winter 2005



Wishing you a
Holiday Season
filled with
Peace and Joy

Inside: **THE NAA PARAGLIDER PROGRAM – PART I** by Hal Emigh
A TALE OF TWO DRAGONS by Ed Rusinek
THAT AFTERNOON OVER THE YALU by James Roberts
BONE, THE NET-CENTRIC B-1 by Richard Parke
B-1B 3RD ANNUAL REUNION by Lee French

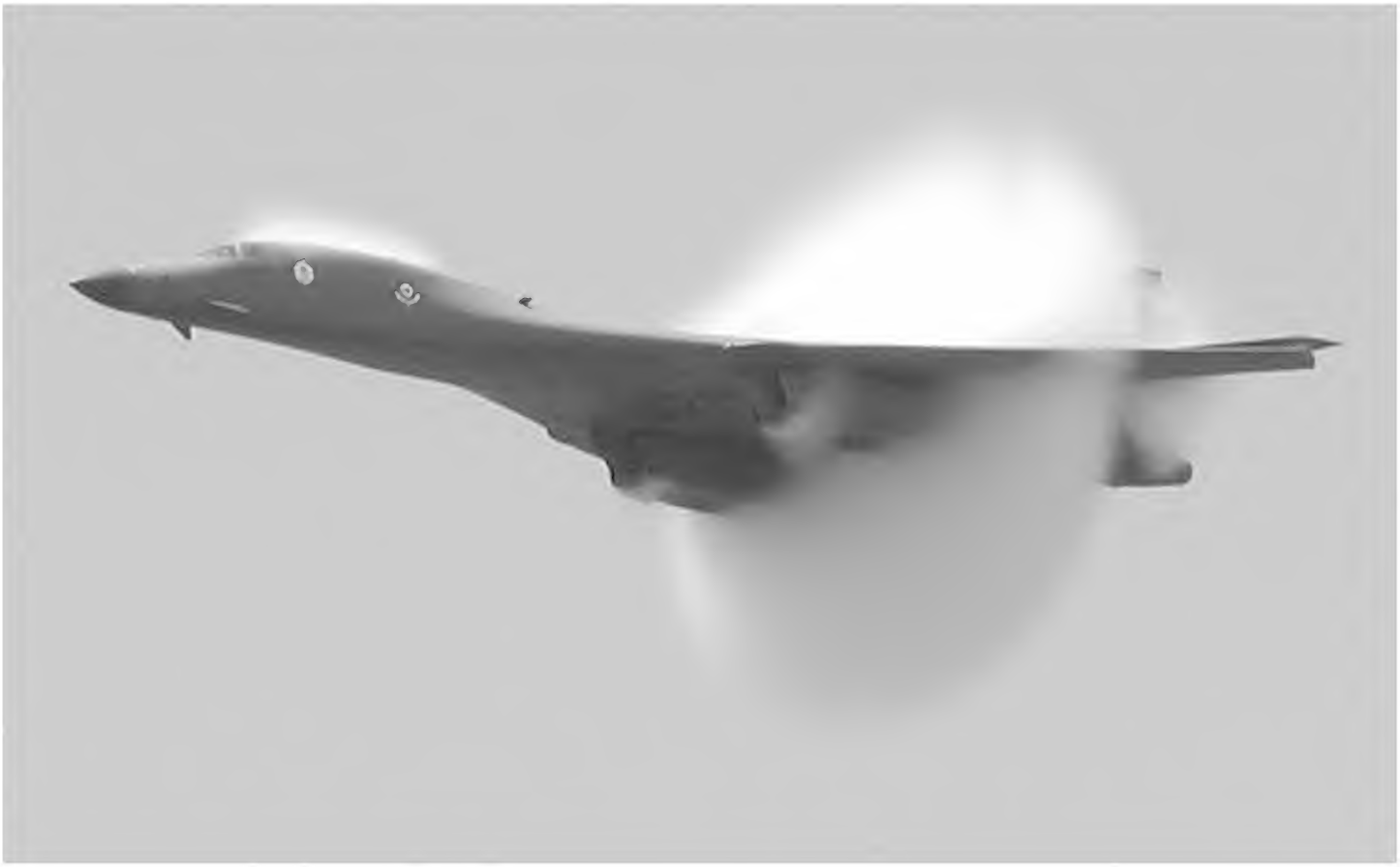


Photo by Gregg Stansbery from BOEING FRONTIERS

Thanks to the Net-Centric Upgrade programs now being incorporated, the B-1B (BONE) Lancer will be adapted to a totally different mission from its original concept. In this photo, pressure produced by the high speed of the aircraft caused water vapor around it to condense into a cloud.

NORTH AMERICAN AVIATION
Retirees Bulletin

NAAR BULLETIN, an affiliate of the **Bald Eagles, Inc.**, is an independent non-profit organization created and operated by volunteer retirees of NAA/ Rockwell/Boeing.

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DEAR NAA RETIREE BULLETIN SUBSCRIBER

With this fourth issue, we bring our bulletins for 2005 to a close. Although we lost our small office at the Seal Beach facility, we managed to cope and get the publication out, printed and addressed every quarter with minimal disruption. It is only because of our splendid staff of volunteers and guest authors, that this could be accomplished.

Since most of our subscribers are retirees in the sunset years of their lives, we normally lose a number of subscribers every year to the Silent Majority. However, there are exceptions to the rule. We again received a letter from one of our disgruntled readers stating that he will not renew his subscription because he never sees any of his friends on the Silent Majority list. With that attitude, I seriously doubt that he has many friends. When I read his letter, I knew what Adlai Stevenson meant when he lost the presidential election to Ike and he said, "I am too old to cry and it hurts too much to laugh."

If you noticed that our bulletin has a more professional look, you are looking at the work performed by our new copy editor, Vince Ramirez. He scans through every word, sentence and paragraph before the bulletin is released to the printer to spot any grammatical errors or sloppy text. We are pleased to add his name to our roster of volunteers.

I was in a doctor's waiting room recently packed with many impatient and sullen patients. I started a conversation with an older gentleman who informed me that he was a poet. With that, he recited several of his poems and soon had everyone in the waiting room smiling. I immediately realized that here was a man who was getting older but definitely not **old**! Always aware that our bulletin could use a cultural stroke, I invited him to join our staff of volunteers. His name is L.B. Strawn. He has no first name. His mother wanted a girl and had a name picked with the initials L. B. When he showed up instead, his mother gave him the name L.B. He agreed to join us as the House Poet and, with this issue, we look forward to 2006 with the first of L.B.'s joyful verses.

The 3rd B-1B reunion luncheon was a huge success. Lee French and the two ladies assisting him, Lynn Isomoto and Mary Finger, had everything beautifully wired and the event went off very smoothly. The guest speaker was an outstanding young USAF captain that commanded a B-1B in Afghanistan and he related a rescue mission involving a crashed helicopter with the twelve men aboard in danger of being captured by the oncoming Taliban. When he finished, all of us had tears of joy and pride in our eyes. America is blessed to have young people like him.

We are blessed to have some great guest authors with some terrific topics in this issue. Rich Parke discusses the latest upgrades being made to the B-1B that will keep it in America's arsenal for decades to come. J. O. Roberts takes us back to the Yalu River where the Americans teach the Communists a lesson in aerial combat. Hal Emigh reflects on the Paraglider project. His article was longer than usual but too good to chop up so we have Part I in this issue and we will have Part II in the Spring 2006 issue. Doing some research on North American aircraft, I discovered that NAA designed and built two different airplanes, the B-21 and the B-28, which the Army Air Corps and the Air Force named *Dragon*. They never got beyond the prototype phase but they made significant contributions to the advancement of bomber design by NAA. Since, I suspect, that very few retirees remember these planes, they are included in this issue.

If your subscription to the NAA Retirees Bulletin will end with this issue, please send in your check and renew for 2006. If you are not sure when it ends, look at the date above your name on the address page (Page 16). If it says **December 2005**, this is your last issue. There will be no further reminders to renew, so please do it at your earliest convenience. If you decide not to renew, goodbye and God bless you anyway!

NAA/ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Frank Zelinski at (562) 866-3195.

The Antelope Valley Retirees Club meets in the South Meeting Room of the Palmdale Culture Center at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell/Boeing retirees are welcome. For information, contact Bill "Tiny" Kistler at (661) 273-0213.

Boeing Valley Retirees Club meets on the 3rd Thursday of each month at the Canoga Park Rec Center, 8500 Fallbrook Avenue, Canoga Park, CA. The president is Jrnnie Muncaster at (818) 341-8919.

Boeing Retirees Breakfast Club meets on the 1st Wednesday of each month at 8:00 AM for breakfast at IHOP Restaurant, corner Fallbrook and Vanowen in West Hills. Contact Howard Seese at (818) 344-7861.

"The Old LAD Stress Group" meets for breakfast approximately every two months at Mimi's Café in Torrance, CA. If you are from the old LAD Stress Group contact Gene Laxton at (310) 378-3113 or Ed Rosenthal at (310) 375-8933.

"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meet at 11:30 AM on the 2nd Wednesday of the month for lunch at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd and Mariposa Ave.

The NAA 101 Tooling Retirees Group meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at Billy's Restaurant, 5160 190th St., west of Anza Avenue in Torrance, CA.

GPS Breakfast Club meets from 6:00 AM to 8:00 AM every Wednesday at the Primrose Restaurant, corner Seal Beach Blvd. and Westminster Blvd. All are invited. For more information, call Fred Shitara at (714) 750-1016.

Seal Beach Retirees Group meets at 11:30 AM on the 3rd Wednesday of the month at "The Fish Co". on Los Alamitos Blvd. at Katella Avenue. For more information call Marvin Blaski at (714) 848-5717 or e-mail to *mblaski@aol.com*.

The Facilities, Industrial Engineering and Plant Services Retirees Group meets at 11:45 AM on the 2nd Thursday of each month at Buster's (formerly Jolly Roger's) Restaurant in the Long Beach Marina. Contact Joe W. Mausser at (562) 596-5845.

"Ye Olde Pharts Breakfast Club" meets at 10:00 AM on the 4th Thursday of each month for breakfast at Polly's Pies at 2025 N. Tustin Avenue in Orange. For information call Don Metzger at (949) 495-5374.

The North American Rockwell Retiree Club of McAlester, OK (a satellite of Tulsa, OK) meets at 10:30 AM on the 3rd Tuesday in March, June, September and December at the Down Town Meeting Place. Call J. A. Darden at (918) 423-0706 for more information.

Tulsa & McAlester Retirees meet for breakfast at 8:00 AM on the 2nd Monday in March, June, September and December at the Ramada Inn, 8181 East Skelly Drive in Tulsa, OK. Call Harry Phillips at (918) 838-3716.

The North American Rockwell Retirees Group of Columbus, OH Engineers and professionals meet at 11:30 AM on the 3rd Thursday of each month at the Berwick Park House. Contact Byron C. Solomides at (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH meets at Noon on the 1st Monday of the month at the Whitehall Community Park on North Hamilton Road in Whitehall. Contact E. Hamilton at (740) 927-5940 for information.

Autonetics Group including Marine Systems, Program Office, Project Office, System Test, Engineers and Designers meets for lunch on the last Wednesday of each month at the HomeTown Buffet, Rose Avenue and Alta Vista Drive in Placentia, CA. Call Mike Vohs at (714) 762-1925 for more details.

Autonetics Industrial Engineering and Maintenance Retirees meet for lunch on the 1st Thursday of each month at the HomeTown Buffet, 390 McKinley, located in front of the Home Depot, in Corona, CA. For more details, call Don Burk at (909) 698-0072.

Autonetics Flight Control Retirees meet at 11:30 AM on the 3rd Thursday of each month except in December at The Lamppost Pizza House located at 17568 Yorba Linda Blvd., corner of Richfield Road, in Yorba Linda, CA. Call Jim Anderson at (714) 779-5620 for details.

Autonetics Retirees meet for lunch at 11:45 AM on the 2nd Wednesday of every month at the Rembrandt Restaurant or Yorba Linda Country Club. All Autonetics retirees, spouses and friends are invited. Contact Robert Nease at (714) 516-1844 or e-mail to *rfnease@email.msn.com* or Ed Venanzi at (714) 779-5652 or e-mail to *EdVennz@aol.com*.

A Group of NAA Retirees meets for breakfast at 8:15 AM on the 1st Wednesday of each month at Knott's Berry Farm-Chicken Restaurant. All are cordially invited. Contact Maxine Haun at *maxi3131@sbcglobal.net*.

Autonetics Financial Luncheon Group meets for lunch at Noon on the last Wednesday of the month at Marie Callendars, 126 East Yorba Linda Boulevard in Placentia. Contact Ken Cantwell at (714) 970-7171 or e-mail *Kcantwell@adelphia.net*.

A Group of Engineering Mgt. meets at 11:30 AM on the 3rd Tuesday of the month for lunch at Denny's on Imperial Hwy. and the 57 Fwy. Call Ed Moran at (562) 697-9949 for information.

NAA Tech Reps Assn. (TRA) Breakfast Club meets at 9:00 AM on the 1st Tuesday of each month at the Carlsbad Airport Restaurant. For more information, call El Presidente Rafael Colunga at (760) 940-0525.

Material Group retirees from Downey and Seal Beach meet at 11:30 AM on the 4th Wednesday of every month at the Stox Restaurant at Imperial Hwy. and Bellflower Blvd. in Downey. Contact Marian Nielson at (562) 429-1020 or Joan Dominguez at (562) 865-7200 or e-mail to *tatedom@aol.com* for information.

Rockwell Vandenberg AFB Retirees Breakfast Club meets at 8:45 AM on the 2nd Tuesday of each month at the IHOP Restaurant in Santa Maria. Contact Marv Bailey at (805) 929-6552 or Al Finlay at (805) 937-3690.

The Hangar Gang meets at the Proud Bird approximately every 4 months. For time, date and other details, call Gene Salvay at (818) 788-3974 or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

ANNUAL EVENT

Bald Eagles 44th Annual Reunion will be held on Saturday, April 8, 2006 at the Proud Bird Restaurant. Call Val Yarbrough at (805) 646-2283.

Flight Test Instrumentation Annual Reunion meets annually at the Fullerton Elks Club. For information, call Frank Vigil at (562) 691-0236.

Tech Rep Association Picnic - A group of retired Field Service Technical Representatives has a yearly picnic in June at a park in Fallbrook, CA. For more information, call TRA President Rafael Colunga at (760) 940-0525 or e-mail to *rafael@nctimes.net*.

The Annual M&P, P.D.L., "Friends Christmas Luncheon" - This group of retirees and employees have assembled in mid-December for a festive luncheon and gabfest for the past 20 years. Those wishing to participate and receive notice of the next December luncheon, call Fred Koeller at (310) 545-8854.

ICBM Reunion – 45th Anniversary of First Minuteman Launch will be held at the Radisson Resort at Cape Canaveral, January 30 through February 1, 2006. Contact Bob Nease at *rfnease@msn.com* or Paul Waite at (321) 638-4161.

Grants Pass NAA/RI Retirees Picnic Reunion will be held on Wednesday, September 6, 2006 at Indian Mary Park. Contact Bob Morse for details at (541) 474-1438 or e-mail to *lindabob2@earthlink.net*.

The NAA Paraglider Program – Part I

by Hal Emigh

Author's Note: This story is a summary of the North American Aviation Space and Information System (NAA/S&ID) involvement in the attempt to develop a land landing system for the NASA Gemini Program. The chronology and dates are accurate from my records and those of NASA. The events of the flight testing are from my memory, and, at my age, there is no guarantee of total accuracy.

Piloted Spacecraft Land Landing Wanted

Following the Mercury program's problem with water landings, NASA was determined to develop a recovery system for the next manned space program that would enable the spacecraft to achieve a piloted landing on land. In the early 1960's, parachute technology was developing with the parasail type chute, but this could not provide the lift-to-drag (L/D) performance or controllability to meet NASA's "desirements".

In the late 1940s, Dr. Francis Rogallo, a NASA Langley Research Center (LRC) scientist, began working on the concept of a paraglider. He envisioned the possibility of a simpler, more practical, and less expensive aircraft for sport and recreation. In the early days, NASA did not wish to fund Rogallo's project so he and his wife continued the development and testing of models on their own in their spare time. He eventually constructed a wing that could be controlled by a pilot and had a reasonable L/D for glide and a controlled landing. Rogallo received a patent for the paraglider in March 1958. This gave birth to hang gliding and powered flight with the Rogallo wing.

As NASA became more interested in land landing for the Mercury follow-on program, Dr. Rogallo began to press NASA to consider his paraglider with an inflatable structure for the wing as an option for the next manned spacecraft. At the same time; several aerospace companies, being aware of NASA's desire for a new recovery system, began investing R&D funds to explore recovery systems that might meet NASA's requirements. NAA/S&ID, Ryan Aircraft, and Goodyear Aerospace were the most prominent of these companies.

Paraglider Phase I Studies – 1961

Finally NASA had taken up the Rogallo idea and initiated the Parasev program (see NASA Photo) to evaluate the pilot controlled characteristics of the Rogallo wing under towing and free flight conditions. With this background, in May 1961 the NASA Space Task Group (STG) headed by Dr. Robert R. Gilruth, issued a Statement of Work for a design study of a manned spacecraft paraglide landing system. The purpose of the study was to define and evaluate problem areas and to establish the design parameters for a system that could provide spacecraft maneuverability and a controlled energy descent and landing by aerodynamic lift.

The paraglider project at NAA/S&ID was under the direction of Bert Witte, the head of the aerodynamics group, with Ash Tischler as the chief program engineer and with flight test operations being led by Myron (Butch) Jackson.

I was not on the program at this time but I believe that the NAA pre-Phase I team had developed a small Mercury-like capsule outfitted with a Rogallo type wing. The wing consisted of inflatable leading edges, keel, and lateral booms made of a rubberized material. A two-lobe sail made of rip-stop parachute material was attached to the leading edges and keel. Initially this model was attached to the top of a van and instrumented in order to acquire aerodynamic data on the wing at various speeds and angles of attack. Apparently, this project provided enough data for NAA to be selected as one of the three contractors for Phase I.



NASA Photo

Along with NAA, Ryan and Goodyear were each awarded a $100K, two-month duration, contract for Phase I of the Paraglider Development Program. From this study, NASA intended to down-select to a single contractor for full development of the system for what was then known as the Mercury Mark II program.

Phase I Extended

During Phase I, which was extended by NASA into Phase I-A, the NAA team developed a small "half-scale" radio controlled capsule outfitted with a wing similar to the original one. The wing leading edges, keel and lateral booms were inflated to an internal pressure to achieve the structural rigidity required to support the aerodynamic loads from the sail. Much of the data needed for wing design was coming from wind tunnel tests being conducted by NASA/Langley. The capsule was towed aloft by a helicopter with the wing pre-deployed. Radio commands were given to control the flight from helicopter release through gliding turns and a flare maneuver to landing. The capsule had a honeycomb crushable pad attached to absorb the impact of landing without damage to the capsule.

I am not aware of what Ryan and Goodyear did during Phase I-A. However, enough flight test and wind tunnel data were gained by NAA at this phase of the program that NASA was willing to proceed with the concept of a land landing system for the Mercury Mark II. NAA was selected as the single contractor for Phase II to develop the Mercury Mark II paraglider landing system.

Phase II-A Awarded to NAA on April 16, 1962

NAA was to conduct a preliminary design and the initial testing of a recovery and landing system that would be compatible with the Mercury Mark II spacecraft. The contract was to determine the optimum performance of a "deployable, flexible paraglide system based on the Rogallo wing".

Phase II-A was to lay the groundwork for Phase II-B of the Paraglider Development Program in which NAA was to develop and fabricate a prototype paraglider landing system, conduct unmanned and manned flight testing and complete the final system design. Ultimately, Phase III implementation was to see the paraglider being manufactured and pilots trained to fly it.

By December 1962, NASA redirected McDonnell Aircraft to drop the Mercury Mark II Project and proceed with the Gemini two-

man spacecraft project. McDonnell had been working on the Gemini design on its own for some time and by the time NAA was brought into the loop, the basic configuration of the Gemini spacecraft was pretty well set. NAA was then directed that all paraglider activity and test vehicles were to be scaled to the Gemini spacecraft and to target the system to be flown operationally on Gemini Flight #2. The configuration of a Gemini with paraglider landing system is shown below. Note skid type landing gear.

The scope of the NAA contract included the design, development and testing of unmanned, radio controlled half-scale and full-scale test vehicles (HSTV/FSTV) replicating the shape and properties of the Gemini spacecraft. With the HSTV leading the way, both vehicles were to ultimately demonstrate high altitude paraglider deployment from a Gemini-like rendezvous radar canister, activate the wing pressurization system, achieve a controlled glide, jettison the wing, then recover the capsule with the emergency parachute recovery system. This required development and qualification testing of recovery parachutes for both vehicles in addition to the paraglider system. After a series of failures and schedule slips, followed by success, both parachute systems were qualified and the actual paraglider testing could begin.

FSTV Testing

The FSTV was extracted on a sled from a USAF C-130 at 35,000 ft above the test range at the south end of the lakebed at Edwards Air Force Base (EAFB). Between January 22 and December 1, 1964, twenty-five FSTV deployment test flights were conducted. The first five flights demonstrated some degree of success, but were aborted and recovered with the parachute system. Flights six and seven were the first fully successful deployment flights. Flights eight through twenty-three achieved some degree of success, but each failed to reach fully stable glide. The final three flights successfully demonstrated the complete test sequence with no problems.

George Jeffs Becomes Program Manager

As the paraglider program became more visible to NASA and was now totally tied to the Gemini program, NAA management decided to elevate the project to a full program level. On September 1, 1962, George Jeffs was appointed as the overall Program Manager. Bert Witte remained on as the program Deputy Program Manager. Within 6 months, the program was further elevated and George was appointed as a NAA/S&ID Vice President.

Ash Tischler remained as the program Chief Engineer; Dr. Chuck Faulders headed the aerodynamics group, supported by Ed Lekawa. Sam Kriedel headed the wing design group with the challenge of finding the right materials for the inflatable structure and sail. Will Owens was primarily responsible for the flight control systems, which included a pneumatic drive system to control pitch and roll of the wing. The overall engineering team was comprised of approximately 100 people. It was a closely-knit team with high expectations for the program.

The flight test group was still headed by Butch Jackson and included Eddie Woo, Bob Saunders, and Ray Braiwick. Harold Roper and Frank Bertolino were the flight test engineers on all FSTV parachute qualification and FSTV deployment flight tests.

About this time, Scott Crossfield, NAA/S&ID Vice President for Test and Quality Assurance (better known for his role in flight testing the X-15), began to take an active interest in the program. At Butch Jackson's recommendation, Scott recruited my father, Harold "Pop" Emigh and myself to return to NAA and join the paraglider flight test team. We had been away from NAA for two years selling do-it-yourself kits for the helicopter designed by Dad (another whole story in itself). A steady job back at NAA looked pretty good at that time, as the kit business was not providing steady income for both families. E. P. Hetzel also joined the program as the test pilot for the planned manned flight test program.

The program team was assigned a corporate Piper Apache for transporting key management and critical parts to the test site on the South Lakebed. The company authorized Hetzel, Jackson, Woo, and Saunders—all licensed commercial pilots—to fly the Apache between Long Beach and the South Base at EAFB. Additionally, a Fokker turbo-prop plane holding about 50 people was also used to ferry the Downey based engineers and technicians. A lot of flight time was accrued by these folks, as there was a flight five days a week and sometimes six or seven days. I think Scott also got a little time in the Apache (probably less exciting than the X-15).

Full-scale Gemini Tow Test Vehicle

In parallel with the HSTV and FSTV development and testing, a separate NAA/S&ID team undertook the design and development of a full-scale replica of the Gemini spacecraft, equipped with a tricycle landing gear (see Concept picture). The purpose of this Tow Test Vehicle (TTV) element of the program was to demonstrate manned controlled gliding maneuvers and landings in a designated zone. The TTV was to be towed to an altitude of 15,000 ft AGL by a helicopter and released for free flight with the pilot to perform pre-planned maneuvers and land in the targeted zone. The planned end use of the TTV was to train NASA Astronauts for recovery and land landing of the Gemini spacecraft.



Concept picture from the Hal Emigh Collection



Concept picture from the Hal Emigh Collection

Wendell Garton was brought on-board, providing manned flight test supervision and as back-up TTV pilot. Harold Roper later became a part of the TTV flight test team after the FSTV program was halted. Rudy Medina and Howard Peregrine were key players in providing test engineering support for all testing and pre-flight checkout at the test site. Both Rudy and Howard were also qualified as flight engineers. Eric Westrup and George Kindelberger headed up the test site logistic team.

I was assigned to work under Butch Jackson to be the flight test representative for the TTV in the interface meetings between the McDonnell Gemini and the NAA Paraglider programs. This assignment required the NAA team to fly to St. Louis every other week, and in most alternate weeks we generally flew to Houston for meetings with NASA. These meetings at the Gemini facility in St. Louis were tightly controlled by Mr. McDonnell. "Mr. Mac" personally approved the minutes of each meeting. This type of coordination between NAA, NASA, and McDonnell continued from late 1963 to mid-1964.

Back at Downey the first TTV was reaching the final stages of fabrication and system testing. After power-on tests and a partial end-to-end systems test, the TTV #1 was transferred to T&QA in the fall of 1963, and I was appointed as the flight test supervisor for this element of the program. After a lot of troubleshooting to clear up "open items" we shipped the TTV to EAFB in early November. The schedule was set for ground tow tests, and to complete a series of manned flight tests over a six-week period. We worked seven days a week, 12 hours a day until the Christmas break at the test site and still we were not ready for the tow tests. Major problems persisted with the pneumatic motor driving the cables to the wing and integrating it with the avionics of the flight control system.

Pre-flight Training for the TTV Team

As a precursor to the TTV manned flight test program, one of the HSTVs was equipped with a tricycle landing gear for the tow test element of the program. During this phase, NAA conducted a series of ground tow tests behind a pick-up truck to evaluate lift-off characteristics at various wing angles of attack and wing rigging settings. This was to be followed by a series of tests with an Army CH-47 helicopter towing the HSTV aloft and releasing it for radio controlled free flight. We quickly discovered the difficulty in synchronizing the air speed of a large helicopter with the lower speeds required to keep the paraglider test vehicle stable while under tow. This later proved to be a major problem in towing the manned TTV aloft.

After much coordination between the HSTV ground controllers, a chase aircraft and the CH-47 pilots, the towing procedures were in place. There were some minor problems but several successful flights were conducted, demonstrating controlled glide and landing following a pre-flare maneuver.

Before starting the actual tow tests with the full scale manned TTV we went through extensive procedures to ensure that the TTV pilot and the CH-47 pilots were in sync on air speed. The low speed required for the TTV (about 45 knots) made the accuracy of a CH-47 airspeed indicator unreliable. The TTV had a pitot tube mounted on a boom protruding from the nose of the vehicle. To enable the CH-47 to read the TTV airspeed we rigged an electrical connection along the 1200-foot tow cable between the helicopter and the TTV and calibrated ammeter for the CH-47 to read TTV air speed.

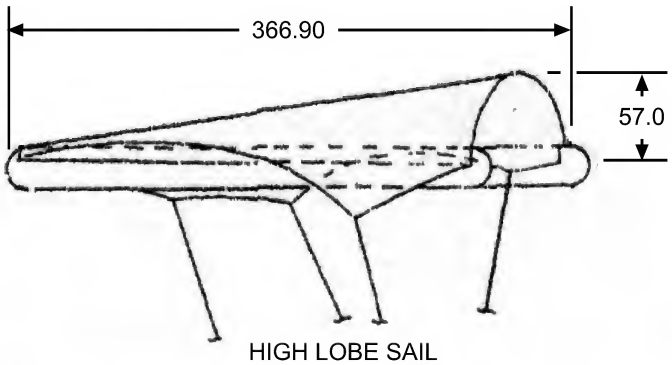
To ensure that this would work, we installed the system between the CH-47 and a small glider piloted by Hetzel. Several tow tests were required to get the air speeds controlled. On one occasion, the glider encountered a tail-on gust which caused it to overshoot the tow cable. Before Hetzel knew it, a part of the slackened tow cable started to wrap around the one wing of the glider. He was afraid if he released the cable it would compound the problem. Hetzel, being Mr. Cool, simply put the wing down and went into a shallow diving turn causing the cable to slide away from the wing. He then released the cable and after leisurely soaring above the lakebed for a few minutes, brought the glider to a perfect landing in front of our hanger on the South Lakebed.

Another lesson learned in these tests was that we had to use a "non-twist" tow cable. We found that a standard cable imparted undesirable torque on the towed vehicle and when released, had a tendency to snap back toward the helicopter. After several weeks of lakebed testing and resolution of the TTV systems problems, we declared the TTV vehicle and flight test procedures ready for manned captive flight.

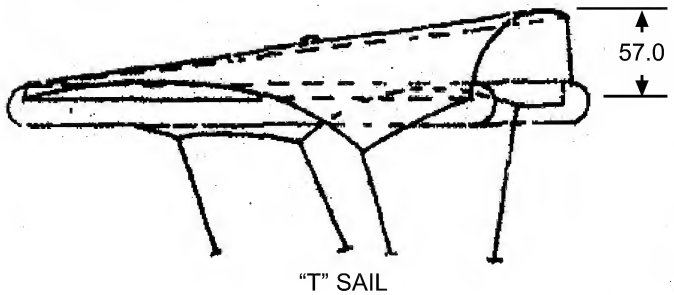
However, before we could start the manned tests, NAA and NASA had to resolve an open issue about the final design of the paraglider wing. NAA had been testing with a "high lobe" wing. NASA/Langley had developed a "T-sail" wing that they thought would provide a better L/D. The differences in these wings are shown in the Drawings below. In wind tunnel tests, it was suspected that the T-sail might have some slight lateral stability problems, but NASA decided that they were not significant and directed NAA to fly the first TTV flights with the T-sail wing. NAA had fabricated and pressure tested one T-sail wing so we were ready with it for these tests.

Paraglider Eliminated From the Gemini Program

As the NAA paraglider test program fell further behind schedule, NASA's plan to put paraglider on Gemini slipped from Spacecraft #2 to #7, then to #9. On June 12, 1964 the paraglider landing system was officially deleted from the Gemini program. NAA was to continue with the paraglider flight test program to demonstrate the technical feasibility of a paraglider recovery and landing system, but was to strip all Gemini-like hardware out of the program.



HIGH LOBE SAIL



"T" SAIL

Drawings from the Hal Emigh Collection

TTV Captive Tow Test

On July 29, 1964, under the revised contract, NAA conducted the first manned captive tow test. With Hetzel in the TTV and a ground crew guiding the wing position, the CH-47 with Major Kluver at the controls began to slowly accelerate. The wing became stable above the TTV and Hetzel called for more speed. The TTV lifted off and Hetzel and Kluver got the air speed synchronized and started to climb to about 2,000 ft. They circled the lakebed while Hetzel tried slight control movements in pitch and roll. Of course, the tow cable influenced the amount of control in either direction.

After about 15 minutes of steady flight time, Hetzel called for the CH-47 to set him up for descent and landing. On the final approach, Hetzel had a little problem in holding the correct angle of attack to keep the tow cable taut but he brought the TTV to a smooth landing. At touchdown, he released the tow cable and a couple seconds later jettisoned the wing. After a total flight time of twenty minutes we all declared the flight a success. However, Hetzel had a difference of opinion, stating that it was one of the most hair-raising test flights of his career. At any rate, NAA and NASA program management declared the TTV ready for the first manned free flight.

It should be noted that throughout the TTV phase of the program, all of the designated Gemini astronauts participated in most of the program reviews and were quite vocal in their opinions both pro and con for the paraglider (mostly con).

TTV Manned Free Flight Test

After much review of the tow test data and still with controversy over the T-sail wing, it was decided to proceed with the first TTV manned free flight using the T-sail. On August 7, 1964 the first free flight test of a manned paraglider was conducted on the South Lakebed at EAFB. Hetzel again was the pilot, equipped with a small diameter quick-opening parachute. Earlier, having convinced NASA that the TTV did not need the Gemini ejection seats we were allowed to put in F-86 seats with the ejection mechanism removed. If Hetzel had to bail out, he would have to decide on jettisoning the wing or going over the side and hope he didn't get entangled with the wing cables.

As with the captive tow test, the TTV took off being towed by the CH-47, with Major Kluver at the controls again. I was flying as an observer in an Army UH-1 Huey helicopter with Capt. Watts as the pilot. My Dad was on the ground in the communications van and we were both in radio contact with the TTV. My job was to observe and report any anomalies and advise Hetzel of the overall condition of the wing throughout the flight.

All went well with the tow, climbing to an altitude of 15,500 feet. The flight plan was for Hetzel to try minor changes in wing angle of attack and at each position to perform S-turns and then set up for a landing in a marked zone on the South Lakebed. After reaching the release point at the extreme south end of the lakebed, Hetzel released the tow cable. For the first few seconds everything seemed to be going well. As Hetzel put in the first command to change angle of attack, a roll oscillation occurred. Hetzel tried countering the roll with no success, then tried returning to the original angle of attack. On advice from the ground, with Dr. Faulders giving input to my Dad, Hetzel tried several changes in wing angle of attack with little or no effect.

During this period the wind was drifting the TTV toward the north and was approaching the EAFB active runway. Capt. Watts called the tower and told them to halt all take-offs as we had an out of control vehicle approaching the runway. Within seconds of that request, an F-102 took off and passed directly between the TTV and our helicopter. It seemed like less than 500 feet separated the three of us. I can't imagine that the F-102 pilot didn't see us both. Capt. Watts raised hell with tower but we got no reply.

By this time the paraglider ground team was advising Hetzel to prepare to get out of the TTV. To quote my Dad, "Hetz, it's about time for you to get the hell out of that damn thing". Hetz casually replied that he was thinking about it and it was a good idea, but he wanted to try one more attempt at gaining control. He was now past the active runways and over the north end of the lakebed. The TTV was in a tight spiral at a fairly high rate of descent. At about 1,500 ft altitude Hetz went over the side. The quick opening chute really worked but he was so low that the chute had barely fully deployed. When he landed, he hit the ground in a backward swing. Major Kluver had jettisoned the tow cable and was following the flight. The CH-47 and my helicopter each landed a few yards from where Hetz was laying on his back. As we got to him he was conscious and said he had a severe pain in his back. He had the parachute D-ring in his hand. I can't remember his exact words but it was something like, "This ring goes on the mantel at home with the other two and I think I am getting too old for this work."

We got Hetzel to the hospital, and thank goodness he had no broken bones, but a very severe back strain. Meanwhile, back at the South Base, the engineering team immediately blamed the control problem on the T-sail wing. Recorded data did not show any other anomalies with the vehicle. George Jeffs convinced NASA and NAA that we should revert back to the High-lobe wing and conduct further radio controlled HSTV tests then attempt another manned TTV flight. TTV #1 was reparable, and we still had TTV #2 available.

LOOK FOR THE EXCITING CONCLUSION IN PART II IN THE SPRING 2006 ISSUE

About the Author: Hal's career at NAA began in 1954 as a design engineer on the Navajo and later on the Hound Dog missile programs. Following the paraglider program, he worked on the initial NASA studies that led the Space Shuttle Program. Later, his participation in the Shuttle Integration Division's proposal as a supervisor of the System Engineering and Integration group was instrumental in the formation of the Shuttle/ Orbiter Payload Integration group. A primary function of this group was to manage the integration of the European Space Lab into the Shuttle Orbiter. Hal's last major assignment was to manage the proposal for the NASA Space Transportation Systems Operations Contract (STSOC). With Bob Minor, he led a team that spent more than a year at Houston winning this strategically critical contract. He retired in 1985 as a Division Director.

After leaving Rockwell, he did aerospace consulting with Booz-Allen Hamilton, Acurex, and in Germany as a consultant to ERNO, planning for the European Space Agency's participation in the U.S. Space Station program. In 1990, he was a consultant for McDonnell Douglas at Huntington Beach and Seal Beach, retiring in December 2004 after more than fifty years in the industry, Hal resides in La Mirada, California with his charming wife Bonnie.

A Tale Of Two Dragons

by Ed Rusinek

*North American Aviation designed two very exceptional bombers, the **B-21** and the **B-28**, which never advanced beyond the prototype stage. Both were given the informal name of **Dragon**. This is their story...*

North American Aviation XB-21 *"Dragon"*

In August 1934, the U.S. Army Air Corps issued Circular Proposal 35-26 for a multi-engine heavy bomber to replace the Martin B-10. First to respond was Douglas Aircraft with the B-18 *"Bolo"* heavy bomber.

Based on the more stringent requirements defined by the subsequent Circular Proposal 36-528, NAA issued General Order NA-21 and began work in January 1936 using solely company funds with no commitment or backing from the government. It was the first bomber and multi-engine project undertaken by NAA.

The prototype NA-21 was completed and test flown for its maiden flight at Mines Field on December 22, 1936 with test pilots D. W. *"Tommy"* Tomlinson and Alex Burton at the controls. During the flight, several difficulties were encountered with tail buffeting and engine overheating. After the incorporation of some modifications, the aircraft was redesignated as Model No. NA-39, accepted by the US Army Air Corps as the XB-21, assigned Aircraft Serial No. 38-485 and given the name *"Dragon"*.

Powered by two Pratt & Whitney R-2180-1 Twin Hornet radial engines equipped with F-10 turbo-superchargers and rated at 1,200 hp for takeoff, the aircraft had a cruising speed of 190 mph with a service ceiling of 25,000 ft and capability of reaching 40,000 feet with the crew sustained by an oxygen system. Of all metal construction, the mid-wing monoplane carried a crew of six and was armed with five .30-caliber machine guns. The maximum range was 3,100 miles, reduced to 1,960 miles with 2,200 pounds of bombs and to 660 miles with 10,000 pounds of bombs.

When tested at Wright Field, the aircraft exceeded performance expectations and appeared to win the competition with the Douglas B-18A for a production order. Price, however, was the determining factor. North American Aviation priced the aircraft at $122,600 each, whereas Douglas was asking only $63,977 per airplane. Douglas was awarded a production contract for 177 B-18As on June 10, 1937. No further XB-21s were built.



Photo courtesy of the Boeing History Archives Office

The NA-21 with supercharger ducting relocated to the sides of the engines and the actual turrets installed became the NA-39 and was designated the XB-21.



Photo from the NAA Retiree Bulletin Files

The XB-21 taking off with actual turrets and new propeller spinners. Although the mid-wing design provided carry-through structure forming the top of a large bomb bay, external horizontal struts (not visible in photo) were installed between the nacelles and the fuselage in front of the wings.

Prototype NA-39 was returned to NAA in Inglewood. However, in 1939, the USAAC purchased the airplane for $555,000 and reassigned it to Wright Field where it was used in a variety of tests. Ironically, the name *"Dragon"* was reassigned to the Douglas B-23, a development of the B-18.

"Dutch" Kindelberger, convinced that North American Aviation had the capability to build a superior twin-engine bomber, initiated the development of Model Number NA-40. A twin-engined, twin-tailed medium bomber, the NA-40 prototype was built in 1938 and flew successfully for the first time on February 10, 1939 with test pilot Paul Balfour at the controls. Provided with more powerful engines, the airplane fared even better during the evaluation trials. Incorporating some changes, the aircraft was redesignated as Model Number NA-62. On September 20, 1939, the USAAC placed an order for 184 planes at a cost of $63,970. each. The plane was designated as the B-25. It was first flown on August 19, 1940. The B-25 differed in design with a lower wing, a redesigned slimmer fuselage and two 1,700 hp R-2600-9 engines.

North American Aviation XB-28 *"Dragon"*

Only two months after work began on the B-25, the USAAC issued an additional contract with NAA on November 15, 1939 for the prototype of an advanced twin-engine, high altitude medium bomber. The fourth venture by the company into the twin-engine bomber design, the capabilities specified for the XB-28 went far beyond any previously defined for medium bombers.

Issuing General Order NA-63, the company began work on the first of two prototypes, Aircraft Serial No. 40-3056. The airplane was given the informal name of *Dragon*. Two Pratt & Whitney R-2800 engines with General Electric superchargers carried the airplane to an altitude of 35,000 ft. The circular fuselage accommodated a crew of five in a pressurized forward section that maintained the pressure equivalent of 8,000 ft up to an altitude of 30,000 ft. The bomb bay was adaptable to carry from twenty 100-pound bombs to two 2,000-pound bombs and could be reconfigured to carry a long range fuel tank for ferrying.



Photo courtesy of the Boeing History Archives Office

The circular pressurized fuselage of the XB-28 appears small when compared to the nacelles for the 2,000 hp R-2800 engines.



Photo courtesy of the Boeing History Archives Office

The XB-28, painted olive drab and gray, awaiting further flight tests at Wright Field, Ohio.

Defensive armament far exceeded that of the early B-25s, consisting of two .50-caliber machine guns in each of three remote-controlled, power-operated turrets designed and built by NAA. Periscopes and scanning devices enabled gunners to spot and track incoming attackers.

The maiden flight of the XB-28 occurred on April 24, 1942 from Mines Field with test pilots Ed Virgin and Joe Barton at the controls. To their delight, the airplane performed exceptionally well at all altitudes.

The airplane had a cruising speed of 255 mph with maximum speed at 373 mph. The service ceiling was 34,600 ft with a range of 2,040 miles carrying a 600-lb bomb load.

A second and lighter version of the airplane was ordered on January 12, 1940: the XB-28A, General Order NA-67. The airplane, Aircraft Serial No. 40-3058, was completed in early 1943. Assigned a reconnaissance role, the turrets were replaced with General Electric turrets and a four-camera photo-mapping installation was added behind the bomb bay. On April 24, 1943—just one year since the first flight of the XB-28, Ed Virgin and Joe Barton completed the first flight of the XB-28A.

Tested very intensely, on August 4, 1943, test pilot Bob Chilton and flight test engineer Roy Ferren flew the XB-28A up the California coast. In a dive to build up speed, they encountered violent tail shaking accompanied by a roll to the left. The airplane could not be controlled and both men had to bail out! As Ferren jumped from the aft hatch and passed under the airplane, he noticed that the vertical tail was bent about 45° to the left. Both men were safely retrieved, but the aircraft plunged into the Pacific Ocean.

Although the B-28 had been fully engineered for production, General Order NA-89, the USAAC decided that the B-25 fully met all future requirements for a medium bomber and there was no need for a high altitude medium bomber. The contract for the B-28 *"Dragon"* was cancelled, however, much of the technical knowledge gained in the design of the pressurized crew cabin was transferred to the design of the Boeing B-29. Thus ended the tale of the two NAA *Dragons*.

From the author: When I was researching the material for this article, to my surprise, there seemed to be considerable information available including a long treatise in Polish. Although each suggested an individual slant, they all centered on the information provided in the book: ***North American Aircraft 1934-1998 Volume 1*** *by Norm Avery. I gathered a composite of all this data and I was tempted to put Norm down as the co-author; but I knew, in his generosity, he would let me "solo". Ed*

The Poet's Corner

Another Year

Another year has rolled around—
Still we can make a joyful sound.
On January first, as the new year starts,
Let us face the future with happy hearts,
For God has granted us this year, just ending,
So unto Him, let our thanks be ascending.
We are thankful to start the new year, being alive,
And knowing we've surpassed two thousand five.
So look, with happiness to what will come today
For which to be thankful, as we go on our way.

—L.B. Strawn

According to our House Poet, one of the best medicines for old age is to be humorous and happy. If you would like to receive a few words of cheer or to send a friend or loved one a happy poem, send your request to L.B. by e-mail. His address is:

lbstrawn@msn.com

Contrails From The Past

by Ed Rusinek

Dear Ed,

Your reference to the Christmas turkey bonus reminded me of the Christmas bonus checks we used to receive. I do not remember the years but they were good checks for the times. I cashed the bonus check on the way home as usual. When I arrived home, my wife Carol asked how much did we get. When I told her, she said, "Let me hold it. I never had a $100.00 bill to hold in my hands in my life!"

We were married in 1939 and just celebrated our 66th wedding anniversary. I started working for NAA on October 23, 1937. It was a good company to work for.

—Cliff Lawrence, Yucaipa, CA

Eds Resp.: Congratulations on your many years of happiness!

That Afternoon Over The Yalu

by J. O. Roberts

In the Summer 2005 Issue, Jim Brooks related the story of the first air battle between four F-86s and twelve MiG-15s, on the morning of December 22, 1950, in which two F-86s were lost to enemy action. J. O. Roberts picks up the story of what happened that same afternoon. Here are his ongoing reflections of that day...

Having been informed the night before that I would not be participating in the morning mission on December 22, 1950, I sacked in until the first flight was readying for departure at 1100 hours. The flight consisted of Lt. Col. Don Nance, Red Flight Leader; Capt. Bud Bock, #2 position right wing; Capt. Nick Farrell, #3 position element leader and Capt. Jim Brooks, #4 position.

When they were joined in battle with the MiGs, I joined the others in the operations tent where we could hear snatches of the action taking place over Sinuiju. "They got Bud." came through faintly and we were jolted by the news, hoping that it was erroneous. Without further confirmation, we could only await the return of the flight to Kimpo (K-14) and count them as they landed. Radio silence on our frequencies had to be observed in case any rescue and recovery action was taking place.

The afternoon flight schedule was posted at the 4th Wing Operations tent. Lt. Col. Glenn Eagleston, Red Flight #1 was leading a section of eight F-86 Sabres. During World War II, he was the leading ace in the 9th Air Force with 20 victories. Red Flight consisted of Eagleston, with 1st Lt. John Odiorne #2, Lt. Comdr. Paul Pugh, on loan from the Navy, #3 and 1st Lt. Bill Yancey #4.

White Flight was led by another World War II ace, Lt. Col. John (J.C.) Meyer with 37 victories with the 8th Air Force. The others in White Flight were 1st Lt. Ward Hitt #2, Myself #3 and my wing man, 2nd Lt. Arthur "Spider" O'Connor #4.

I believe that I was chosen for this assignment due to the high flying time I had on the F-86 and because I was a member of the winning 1949 USAF-wide gunnery championship team in both air-to-air and air-to-ground catagories. My wing man, "Spider", was from the 336th Squadron, our hosts at Kimpo, and was soon to prove a cool headed fighter pilot in all situations.

As we approached our aircraft on the frozen turfed flight line, I confirmed with my armorer that my Sabre's six .50-caliber machine guns had been boresighted to converge at 1,000 ft in front of my aircraft to give me maximum kill power at that range.



Photo from the Author "Spider" O'Connor Collection

F-86s forming up on the runway at heavily damaged Kimpo Air Field for takeoff in formation in December 1950.

Pre-briefed to maintain radio silence, we started our engines and began taxiing out to the active runway following hand signals from Meyer. Eagleston and Red Flight had preceded us to takeoff by five minutes in order to stagger our time of arrival in the anticipated combat area by that amount of time.

J.C. took his position on the left half-width of the runway, leaving room for his wingman to his left. I took up my position on the right half width of the runway with my wingman, "Spider", on my right. Thus, we took off to the NE in a loose fingertip formation and avoided circling prior to climb out to the North to save fuel.

RED FLIGHT			WHITE FLIGHT		
	#1			#1	
#3		#2	#2		#3
#4					#4

As we passed through 12,000 ft in our climb to the NW and were beyond the bomb line in our loose formation, White Flight leader ordered a gun check. We switched our guns on and pressed the trigger for a second or two to test all six machine guns. All fired properly.

J.C. headed us toward the NW mouth of the Yalu River, planning to keep the sun to our left and behind us in relationship to where we expected the MiGs to be climbing from their base at Antung.

As we climbed through 35,000 ft, I spotted several silver flashes in that location and called out, "White Leader, I have several bogeys at 2 o'clock low, climbing". J.C. didn't see them immediately and replied, "White 3, permission to identify and attack".

We all dropped our tanks and I turned right to move in behind the bogeys. I called out, "White 3, Bandits confirmed". I eased in behind the MiGs lead element who reversed his turn back to the left and started a shallow descending left turn. I was able to throttle back and take up a position several thousand feet behind him. As we descended in the shallow turn to the left and closed to approximately 1,000 ft, I framed the MiG in the reticle of my gunsight and opened fire!

My tracers arced directly in on top of the MiG's fuselage, striking the entire length from nose to tail with maximum concentration on the canopy. The MiG did a half roll and dove directly into the side of a small mountain, exploding on impact.

As I throttled back and began a turn over the smoking wreckage, I became aware of cannon fire tracers passing wide off my right wing! Calling out to my wing man, "Spider" O'Connor that I was under attack, he replied laconically, "Yeah, I've been trying to tell you through all the radio chatter. I'm on his tail now."

Whereupon, "Spider" opened fire with a very positive effect. The MiG pilot apparently panicked and not realizing that he did not have enough altitude or control to complete the maneuver, half rolled and dove straight down into the mountain side below. He exploded on impact.

Upon verifying both kills, we proceeded to climb back towards the ensuing fray above us toward the NW. However, "Spider" called in, "Bingo" (low fuel), so we had to turn away to the south without finding further action.

All eight Sabres returned to Kimpo safely without damage after a resounding 6-0 victory in this first all jet battle. In addition to our two successes, Lt. Col. Meyer shot down a MiG-15 as did Lt. Col. Eagleston, his wingman 1st Lt. John Odiorne and Lt. Cmdr. Paul Pugh.

The success of this mission would be attributed to J. C. Meyer's and Glenn Eagleston's planning to arrive at the MiGs expected climbing corridor at the mouth of the Yalu River with the sun behind us and with adequate fuel for significant combat maneuvering from a favorable position.

Rudyard Kipling's line from the poem *"That Day"* spoke the truth...*"So we had to pay for teaching—An' we paid!"*

Only this time, those who paid were the Red pilots who were overwhelmed and taught by our tactics, training and leadership.

And what of those magnificent men that made up Red Flight and White Flight on that cold day of December 22, 1950? Lt. Col. J.C. Meyer became a four star general and commander of Strategic Air Command, Lt. Yancey retired as a Major General and Lt. Cmdr. Pugh as a Rear Admiral. Lt. Col. Eagleston and Lt. Odiorne retired as Colonels and Lt. Hitt left the USAF. "Spider" O'Connor and I followed Jim Brooks and joined North American Aviation as test pilots.

About the Author: Completing two years at Yale University, J. O. entered the USAAC pilot training program and graduated as a 2nd Lt. in January 1944. He was assigned to the Aleutian Islands to fly combat air patrol in a P-40. In the post-war USAAF, he tested the P-51H at Pinecastle AFB in Orlando, FL and flew the P-80 in the Philippines and Okinawa. He was the 1948 USAAF gunnery champion. Assigned to a fighter squadron in the Korean War flying the F-86 Sabre, he was promoted to the rank of Major.

Joining North American Aviation as a test pilot in 1952, He did extensive testing of the redesigned F-100A after the death of Chief Test Pilot George Welch. Other aircraft he flew were the F-86D, E, F and H; the F-100A, C, D and F; the F-107A; and the T-39 Sabreliner. He later became the NAA corporate representative at NASA JSC, KSC and Washington D.C. J. O. retired in 1982 and currently resides in San Diego, CA with his charming wife Susie. Ever the loyal wingman, Arthur "Spider" O'Connor provided some added details to this article.



Photo from the J. O. Roberts Collection

Test pilot J. O. Roberts in the cockpit of an F-86 just prior to a test flight.

The Grants Pass Annual NAA/RI Retirees Reunion held September 7th at The Brewery



Back row, left to right: Audrey Corkery, Ida Francis, Les Canterbury (face half-hidden), Gil Judson, Marlin Albert, Diane Albert, and Bob Cragin.
Middle row: Tim Corkery, Ralph Leonard, Bev Leonard, Esther Weddle, Gene Miles, and Gerald McGee.
Front row, kneeling: Bill Francis, Neel Weddle and Linda Morse. Bob Morse took the picture.

BONE, The Net-centric B-1

by Rich Parke

The B-1 Lancer has played a major role in the recent conflicts in Iraq and Afghanistan. The swing-wing bomber's superior performance is defined in the excellent range, speed and loiter capabilities, coupled with a large payload of modern conventional weapons. With the robust structural design and relatively low flight hours on the airframe, the B-1 is expected to serve for another forty years.

In order to ensure long term operational capability, the USAF has contracted with Boeing for the next major improvement to the airplane. Boeing is in the initial stages of a network centric upgrade program that will allow the B-1 crews to capitalize on the plethora of information available in future conflicts. This will include new color displays, secure digital radios, a moving map and decision-aiding software.

The B-1 or BONE as it is known by its crewmembers, was designed in the 1970s to launch up to 14 externally carried long range nuclear cruise missiles at fixed targets from outside of Soviet air space and then to employ its terrain following capability to penetrate deep into hostile territory. These penetrating missions were rigidly planned in terms of route, targets and timing. Crews referred to this as "black line" bombing since the aircraft followed a predetermined route to the targets as depicted by a black line on the map.

In 1992 at the end of the Cold War, the BONE began a transition from the nuclear role, and as a result, its nuclear missiles and bombs were replaced with the GPS-guided Joint Direct Attack Munition (JDAM), the Joint Air-to-Surface Missile and other conventional weapons. The three bomb bays allowed the carriage of three different weapon types on a single mission, providing unprecedented flexibility to combatant commanders.

The BONE's targets set has changed from a series of large fixed targets to a widely dispersed set of mobile targets. Instead of attacking large infrastructure, the B-1 is more likely to be used to disable a single fleeting target while minimizing collateral damage, followed by a series of targets in close proximity to friendly troops.



Photo from the Boeing Frontiers Magazine

Boeing employee Jill Carlisle in the cockpit of a B-1B, performing a checkout of recent modifications. The displays directly in front of her will be replaced as part of the B-1 Network Centric Upgrade.

The B-1 has been dubbed the "roving linebacker" due to the large payload of weapons and fuel it carries, permitting it to loiter for a long time waiting for a target to emerge. With current equipment, when a target is detected by ground troops or intelligence assets, the target coordinates are given to the crew verbally by secure radio. The crew transcribes the coordinates, determines the proper route and altitude, and manually enters this information into the BONE's mission computers. Once in range, the aircraft automatically opens the door, programs and releases the proper weapon. Given the tools at their disposal, the crews have done an admirable job; reprogramming the aircraft while in flight and striking up to two dozen separate aim-points in a single sortie.

It is projected that future targets will include those which are more fleeting and distributed. The additional goal of no collateral damage is driving requirements for weapons to be much smaller and more accurate. For example, the next new weapon is the 250-lb Small Diameter Bomb (SDB). The BONE will be able to carry up to 96 SDBs or combine the SDBs with other weapons to provide a flexible response to unique target deployments.

The impact on the crew to manually target 96 weapons in flight against 96 independent targets would be overwhelming. This requirement to rapidly retarget large number of weapons coupled with the increase in the amount of information available to the crew is driving the need to digitally connect the BONE to the emerging Global Information Grid. The digital connection will provide graphical situational awareness and textual tasking that will reduce the potential for error and free the crew up to perform critical tasks.

To that end, Boeing is under contract to the USAF to develop a series of B-1 Network Centric Upgrade. This includes the Threat Situation Awareness System to add a new display architecture and four new color displays in the front crew station. Also, the Fully Integrated Datalink (FIDL) Program that will add an over the horizon secure UHF data link to provide Link-16 tactical data to the crew. FIDL will also add five new color displays to the aft crew location.

The vision for the BONE NCU Program is to enhance the vehicle's incredible flexibility to perform multiple missions in a single sortie.

These NCU programs will be fielded in the next five years, giving crews the tools to keep the BONE the most valuable plane "MVP" in future conflicts for decades to come.

About the Author: Rich Parke is director of B-1B/B-2 advanced programs. He works within the Boeing Bomber Program Office to determine business objectives, strategies and tactics to ensure the future of the USAF bombers. Rich manages research funding to develop hardware and software prototypes and operational systems. His previous assignments include program management for the B-1B advanced programs and various design assignments on the B-1B, the National Aerospace Plane and the AC-130U Gunship. Rich resides with his charming wife Margret in Palos Verdes Estates, CA.

From the Editor: A briefer version of this article appeared in the August 2005 issue of Boeing Frontiers. *Aware of the special meaning that the B-1 has to all of us, the author and editors very generously consented to the printing of the article in the NAA Retirees Bulletin.*

Third Annual B-1B Reunion on September 24, 2005 at The Golden Sails in Long Beach

Photos by Lee French

We thought it could not get any better...but it did! Our B-1B Reunion was attended by 151 participants who are either currently working or have retired from the B-1 program. It included individuals that worked and agonized over this magnificent airplane from pre-production through cancellation, resumption and, finally, full production.

There were attendees from as far away as Florida, Northern California, Nevada and Arizona. Also, there were some familiar faces that could not be with us and they were missed.

The speaker, Captain Jason Digiacomo, currently assigned to Edwards AFB, was a USAF B-1B combat pilot who flew the airplane in action over the skies of Afghanistan. His exciting and action-filled account of his experiences with the aircraft enthralled all of us.

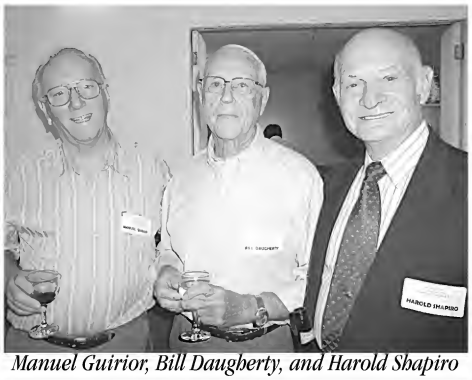
On display were a lot of "memories" including posters, *Skyline* magazines, *Skywriter* newspapers, and B-1 memorabilia such as cups, pins, ties and hats.



Guest Speaker Capt. Jason Digiacomo, Wendy Digiacomo, and Scott White



Jack Ross, Toni Ross, and Don Wegner



Manuel Guirior, Bill Daugherty, and Harold Shapiro



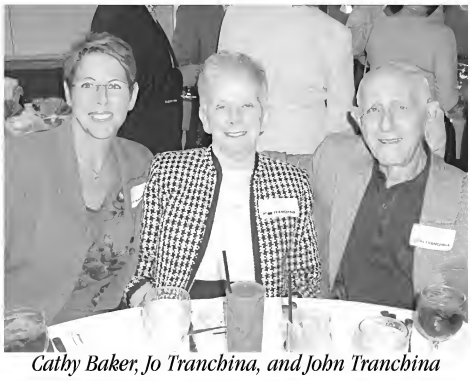
Ruth Rusk, Armetta Vance, and Donna Black



Frank Moon, Tom Logan, and James Kragh



Ruby Glass and Norm Martin



Cathy Baker, Jo Tranchina, and John Tranchina



John Gregory, Lana Aggelen, Brenda Pittman, and Pete Maury



Jim Gallgher, Carolyn Morris, Tom Smith, and Lynn Gulick



Lynn Isomoto, Dave Quijano, Gregg Jones, and Ace Evans

The Silent Majority

by Stan Guzy

AARON, ROBERT H., 94 – died at his home in Laguna Woods, CA on July 18, 2005 after a brief illness. A mechanical engineer, Bob began his career with NAA/RI in the late 1950s. He was extremely proud of his role as a contracts manager on space programs, including the Apollo and the Space Shuttle projects. He retired from NAA/RI in 1975. He was a long time leader and active volunteer in the Orange County Jewish community. A large and loving family survives him.

ANDERSON, JAMES R., 82 – of Anaheim, CA passed away on September 28, 2005 of complications after a prolonged battle with cancer. Jim was an Autonetics engineering manager prior to his retirement in 1986 after 35 years of dedicated service. He is survived by his wife of many years, Harriet.

BELL, ANTHONY A., "TONY", 68 – of Orange, CA died on September 21, 2005 after a long and valiant battle with prostate cancer. Tony worked in Marine Systems Engineering after joining Autonetics in 1964. He was a director of Engineering at NAA/RI when he retired in 1988. He also served on the RI Credit Union Board until his death. He is survived by his beloved wife of 40 years, Claudina.

BLACKWELL, WILLIAM L., 79 – passed away on September 6, 2005 of cancer in Orange, CA. Bill was a corporate attorney for NAA/RI, beginning at the Columbus Division in 1951. Bill served his entire career in the area of Contracts and Pricing, specializing in International Law. He retired from Autonetics in 1988. His beloved wife Rachel survives him.

BONNICI, HARRY, 83 – died in Mission Viejo, CA on October 14, 2005 of undisclosed causes. He had been an engineer with NAA/RI. No further information was provided.

BOSTATER, GEORGE, 72 – passed away from complications of cancer in late summer of 2005. George had a rare talent of being able to develop an educated estimate of any aerospace program with little more than an engineering definition/concept to rely on. His expertise proved invaluable in the early stages of the B-1 program. George left NAA/RI but rejoined the management team in 1975 as a pricing manager and remained in managerial positions until his retirement in the late 1990s.

BREWER, PAUL W., 88 – passed away on September 15, 2005 in Lancaster, CA. Paul was in flight test engineering on the B-25, B-28, XP-82, XB-45, AJ-1, XA2J, XA3J-1 and the B-1. In 1933, Paul founded Muscle Beach in Santa Monica. His wife Marilyn survives him.

CADICK, ROBERT N., "BOB", 81 – died in Coeur d'Alene, ID in October 2005 of Parkinson's disease. Bob was a service engineer at LAD and Palmdale on various aircraft, transferred to Downey on the Apollo and Shuttle programs and retired from the Hanford Nuclear Facility in Washington State in 1985 after 39 years of service. His loving wife Alice survives him.

FAULKNER, LADD W., 84 – died on August 21, 2005 due to cancer complications. He was a resident of Anaheim, CA and was a retired systems analyst for NAA/RI. No further details available.

GARTON, WENDELL P., 89 – of Huntsville, AL, died on October 15, 2005 of undisclosed causes. Following service in Korea, he joined NAA as a flight test engineer in Downey, CA. He participated in the Hound Dog cruise missile program, early mission planning for the Apollo lunar landing program and conducting base heat tests for the Space Shuttle Orbiter. He served in the Marine Corp Reserve as a Lt. Col. for many years. His wife Mildred predeceased him.

GERMAN, BOB, 77 – of Irvine, CA died of undetermined causes on September 9, 2005. He was listed as a retired RI salesman. His wife Arlene survives him.

GUTHRIE, GERRY, 75 – died on September 5, 2005 of undisclosed causes. Gerry began at NAA in 1958 after serving as an electronic technician in the Navy. He worked in the Program Planning and Control area when he retired in 1995 after 37 years of service.

HERNANDEZ, JESUS, 69 – died on October 22, 2005 after suffering a heart attack. He lived in Brea, CA and retired from NAA/RI as a shop planner. His wife Helen survives him.

HUSA, ALFRED, 95 – died in Columbus, OH on August 18, 2005. Alfred worked at the LAD, Kansas City, Long Beach and Columbus facilities as a flight inspector. He retired in 1968 after 31 years of service.

KILLION, DEWEY, 83 – passed away peacefully at his home in Atascadero, CA on August 11, 2005 after battling cancer. Dewey joined NAA in 1948 as a flight mechanic and retired from Autonetics Defense Systems in 1983 after serving for 35 years. He is survived by his wife of 21 years Willa.

KOCH, HOWARD M., 79 – passed away of undisclosed causes at his home in La Habra, CA on Au-

gust 17, 2005. Howard joined NAA in Downey, CA as an electrical engineer and was involved in an imposing list of space programs. He had progressed to GPS engineering management when he retired in 1986 with 30 years of service. His beloved wife of 57 years, Barbara, survives him.

KRIEGER, GARY J., 71 – died of undisclosed causes on July 23, 2005. He had retired from NAA/RI/Boeing at the Autonetics Division where he worked as a computer program analyst. His dear wife of 45 years Patricia predeceased him.

LEICHTWEIS, CHARLES M., 90 – of Anaheim, CA died of natural causes on October 16, 2005. He was a retired general manager from RI. His wife, Norma Jean, survives him.

LIMBESON, REV. FR. JOHN M., 83 – died of congestive heart failure at his home in Laguna Woods, CA on August 19, 2005. John retired as an industrial engineer from Autonetics in 1981 after 25 years of service. He then became an Orthodox priest and was active in his church for 20 years. His devoted wife Betty survives him.

MACH, HENRY, 84 – passed away in Crete, NE on October 3, 2005. Henry worked at the LAD, Kansas City, Long Beach and Columbus facilities in subassembly and plastics. He retired in 1976 after 37 years of service.

MACHA, CHARLES F., 86 – passed away on May 3, 2005 of acute leukemia. He was a planning department supervisor at LAD.

McDERMOTT JR., THOMAS C., 78 – died of natural causes on September 29, 2005 in Medford, OR. Tom started at Autonetics in 1959, transferred to Space Division on the Apollo and ended in the Corporate Offices as Vice President of Quality Control. He retired in 1988 after 29 years of service.

McQUILKIN, FREDERICK T., 83 – passed away in Long Beach, CA on October 27, 2005 with his wife, Lavonne, at his side. Fred joined NAA at LAD in 1942 as an engineer. He made many valuable contributions to aircraft design and had more than 20 patents in his name. He retired in 1995 after 53 years of service. In retirement, he was an active volunteer at the Aquarium of the Pacific in Long Beach.

MOELLER, CALVIN E., 84 – died at his home in Bend, OR of prostate cancer on July 7, 2005. Calvin was a metallurgist in the LAD Production Development Lab and retired from Rocketdyne after almost 30 years of service. His wife Jeanne survives him.

SAND, CHRISTOPHER, "CHRIS", 88 – passed away on August 13, 2005 in Fullerton, CA after a short illness. He joined the engineering force of NAA in 1955. He worked on the Apollo program, the Space Shuttle program and the B-1 project before retiring in 1977 after 22 years of service.

SEATON, WALTER L., 86 – died on September 10, 2005 of natural causes. He was a retired NAA/RI/Boeing aerospace planner.

STROOP, OLIVER W., "OLLIE", 87 – passed away on October 24, 2005 at St. Andrea, CA of a heart condition. She worked in the Production Planning Department and retired from El Segundo in 1979 after 29 years of service. Apparently, her father wanted a boy so he named her Oliver.

TIVENAN, EDWARD P., 82 – Ed passed away on September 25, 2005 from emphysema and pneumonia. He chose a career in contracts management and served as a pricing supervisor on the Saturn program. He married his childhood sweetheart, Dorothy, 57 years ago and she survives him.

TOFT, MAX E., 77 – passed away in Fullerton, CA on August 22, 2005 from undisclosed causes. He was a supervisor in the Package, Handling and Transportation Design Group at LAD when he retired in 1988 after 34 years of service. Max also designed the special railroad car to transport the B-1B nacelle from the Columbus Division to the Palmdale facility. His caring wife Connie survives him.

YARD, JOHN S., 78 – John resided in Garden Grove, CA and died of congestive heart failure on August 26, 2005. He was a retired NAA/RI engineer and is survived by his wife Norma.

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North American Aviation Retirees Bulletin

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IF THE DATE ABOVE YOUR NAME IS DECEMBER 2005 AND YOU HAVEN'T YET RENEWED –
THIS IS YOUR LAST ISSUE!



Photo from the J. O. Roberts Collection

In the first major air battle of the Korean War on the afternoon of December 20, 1950, eight F-86s engaged fifteen to twenty-five MiG-15s over the Yalu River. Six MiGs were shot down with no losses to the Americans. Sharing smiles of victory, left to right, are Capt. James Roberts of Washington, 1st Lt. Ward Hill of Kansas City, Lt. Col. John C. Meyer of Forest Hills, N. Y. and 2nd Lt. Arthur "Spider" O'Connor of St. Joseph, Mo.

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION Retirees Bulletin

Spring 2006

Inside: **THE NAA PARAGLIDER PROGRAM – PART II** by Hal Emigh
TAMING THE HUN by Jack Bailey
UNMANNED SATELLITES AT SEAL BEACH – THE EARLY DAYS by Kyle Vaught



Photo courtesy of the Boeing History Archives Office

NAA Chief Test Pilot George "Wheaties" Welch in the cockpit of the YF-100A, Aircraft No. AF52-5754, at Palmdale, the first man to break the sound barrier in level flight on May 25, 1953, was subsequently killed on October 12, 1954, in F-100-1, Aircraft No. AF52-5756, when the plane disintegrated during a 7g pullout at Mach 1.55. Always a free spirit, "Wheaties" managed to get airborne during the attack on Pearl Harbor in his P-40B and shoot down four Japanese aircraft. He did not receive the Medal of Honor for his action because he did not wait for his commanding officer to give the order to takeoff. While testing the XP-86 in October 1947, he "unofficially" broke the sound barrier twice in a dive before Chuck Yeager did it in level flight in the rocket powered X-1.

NORTH AMERICAN AVIATION
Retirees Bulletin

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DEAR NAA RETIREE BULLETIN SUBSCRIBER

We begin the new year with three outstanding articles from three different programs within North American Aviation. But first, I would like to express, in my humble way, a few words of pride for having had the honor of having worked at North American Aviation. From the day that I received a telegram from NAA in 1950 offering me a position as a Stressman B until the day in 1999 when I retired, I have always felt that North American Aviation was the very best of companies in the industry. Oh yes! There were some dimwits. But they were far outweighed by the single largest conglomeration of brilliant, inspiring and visionary minds ever assembled. Even I did not fully appreciate their accomplishments until I started to read the stories that we have published and continue to publish in this journal of our past. We worked among giants and we did not recognize them because there were so many of them!

As you read these stories, recognize the individuals for their courage, their intellect, and yes, even their audacity. It seemed like nothing was ever impossible! Contracts may have been cancelled, devices may not have been invented yet, disasters may have struck but the drive to advance never stopped—Push on!—Push on! North American Aviation is no more. It came out of the Depression like a bright comet and disappeared into oblivion in the span of some fifty years. But it left behind a heritage of some of Man's greatest scientific achievements that many will use for decades to come but not even be aware of where they came from.

In this issue, we bring you the exciting conclusion of the Paraglider story by Hal Emigh. It is not a story of a huge contractual success but it is a story of determination and courage. It is a story of learning from your mistakes and pushing on. Pushing on when everyone else is walking away and telling you to cut your losses. The second story is from the field and tells of the experiences of Field Rep Jack Bailey with the F-100 Super Sabre, the first jet aircraft to break the sound barrier in level flight and to do it on its maiden flight.

Some of you have complained that we never have articles about the other divisions. Well, in this issue Dr. Kyle Vaught gives a splendid account of how North American Aviation/Rockwell became a powerhouse in the unmanned satellite industry after other companies were already recognized as leaders in the field.

With all the renewals and new subscribers, we are sorry to report that the total number of subscribers has fallen drastically by several hundred. We know that we have lost many to the Silent Majority and that many of you are suffering from the pains of old age and are losing touch with daily living. To all who are no longer with us, we say, "Farewell and may you always stand in the shadow of God's Blessing!"

Don't forget the Bald Eagles Reunion! We hope to see all of you there. So do make an effort and join us in reminiscence and fellowship.

THE 44TH BALD EAGLES REUNION WILL BE HELD ON SATURDAY, APRIL 8, 2006 AT THE PROUD BIRD RESTAURANT 11022 AVIATION BLVD. (AT 111TH STREET)

Doors open for social at 10:00 am
Seating for lunch at 12:00 Noon

SEND YOUR CHECK FOR $20.00 PAYABLE TO **BALD EAGLES, INC.** TO:
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Include with your check the name you wish on your badge and the name of each guest included in your payment. Tickets and badges will be issued as you register at the door. Seating is limited so order your tickets early. No tickets will be sold at the door. Sorry, no refunds after March 20, 2006.

There are no service requirements to attend – Just the love for Airplanes and Spaceships – Meet old friends – Make new ones! Parking is limited—Carpooling and early arrival is encouraged!

NAA/ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Frank Zelinski at (562) 866-3195.

The Antelope Valley Retirees Club meets in the South Meeting Room of the Palmdale Culture Center at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell/Boeing retirees are welcome. For information, contact Bill "Tiny" Kistler at (661) 273-0213.

Valley Aerospace Retirees Club meets on the 3rd Thursday of each month at the Pratt & Whitney Rocketdyne Fitness Center at 8500 Fallbrook Avenue, Canoga Park, CA. The president is Dennis Larson at (818) 340-6031.

Boeing Retirees Breakfast Club meets on the 1st Wednesday of each month at 8:00 AM for breakfast at IHOP Restaurant, corner Fallbrook and Vanowen in West Hills. Contact Howard Seese at (818) 344-7861.

"The Old LAD Stress Group" meets for breakfast approximately every two months at Mimi's Café in Torrance, CA. If you are from the old LAD Stress Group contact Gene Laxton at (310) 378-3113 or Ed Rosenthal at (310) 375-8933.

"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meet at 11:30 AM on the 2nd Wednesday of the month for lunch at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd and Mariposa Ave.

The NAA 101 Tooling Retirees Group meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at Billy's Restaurant, 5160 190th St., west of Anza Avenue in Torrance, CA.

GPS Breakfast Club meets from 6:00 AM to 8:00 AM every Wednesday at the Primrose Restaurant, corner Seal Beach Blvd. and Westminster Blvd. All are invited. For more information, call Fred Shitara at (714) 750-1016.

Seal Beach Retirees Group meets at 11:30 AM on the 3rd Wednesday of the month at "The Fish Co". on Los Alamitos Blvd. at Katella Avenue. For more information call Marvin Blaski at (714) 848-5717 or e-mail to *mblaski@aol.com*.

The Facilities, Industrial Engineering and Plant Services Retirees Group meets at 11:45 AM on the 2nd Thursday of each month at Buster's (formerly Jolly Roger's) Restaurant in the Long Beach Marina. Contact Joe W. Mausser at (562) 596-5845.

"Ye Olde Pharts Breakfast Club" meets at 10:00 AM on the 4th Thursday of each month for breakfast at Polly's Pies at 2025 N. Tustin Avenue in Orange. For information call Don Metzger at (949) 495-5374.

The North American Rockwell Retiree Club of McAlester, OK (a satellite of Tulsa, OK) meets at 10:30 AM on the 3rd Tuesday in March, June, September and December at the Down Town Meeting Place. Call J.A. Darden at (918) 423-0706 for more information.

Tulsa & McAlester Retirees meet for breakfast at 8:00 AM on the 2nd Monday in March, June, September and December at the Ramada Inn, 8181 East Skelly Drive in Tulsa, OK. Call Harry Phillips at (918) 838-3716.

The North American Rockwell Retirees Group of Columbus, OH Engineers and professionals meet at 11:30 AM on the 3rd Thursday of each month at the Berwick Park House. Contact Byron C. Solomides at (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH meets at Noon on the 1st Monday of the month at the Whitehall Community Park on North Hamilton Road in Whitehall. Contact E. Hamilton at (740) 927-5940 for information.

Autonetics Group including Marine Systems, Program Office, Project Office, System Test, Engineers and Designers meets for lunch on the last Wednesday of each month at the HomeTown Buffet, Rose Avenue and Alta Vista Drive in Placentia, CA. Call Mike Vohs at (714) 762-1925 for more details.

Autonetics Industrial Engineering and Maintenance Retirees meet for lunch on the 1st Thursday of each month at the HomeTown Buffet, 390 McKinley, located in front of the Home Depot, in Corona, CA. For more details, call Don Burk at (909) 698-0072.

Autonetics Flight Control Retirees meet at 11:30 AM on the 3rd Thursday of each month except in December at The Lamppost Pizza House located at 17568 Yorba Linda Blvd., corner of Richfield Road, in Yorba Linda, CA. Call Jim Anderson at (714) 779-5620 for details.

Autonetics Retirees meet for lunch at 11:45 AM on the 2nd Wednesday of every month at the Rembrandt Restaurant or Yorba Linda Country Club. All Autonetics retirees, spouses and friends are invited. Contact Robert Nease at (714) 516-1844 or e-mail to *rfnease@email.msn.com* or Ed Venanzi at (714) 779-5652 or e-mail to *EdVennz@aol.com*.

A Group of NAA Retirees meets for breakfast at 8:15 AM on the 1st Wednesday of each month at Knott's Berry Farm-Chicken Restaurant. All are cordially invited. Contact Maxine Haun at *maxi3131@sbcglobal.net*.

Autonetics Financial Luncheon Group meets for lunch at Noon on the last Wednesday of the month at Marie Callendars, 126 East Yorba Linda Boulevard in Placentia. Contact Ken Cantwell at (714) 970-7171 or e-mail *Kcantwell@adelphia.net*.

A Group of Engineering Mgt. meets at 11:30 AM on the 3rd Tuesday of the month for lunch at Denny's on Imperial Hwy. and the 57 Fwy. Call Ed Moran at (562) 697-9949 for information.

NAA Tech Reps Assn. (TRA) Breakfast Club meets at 9:00 AM on the 1st Tuesday of each month at the Carlsbad Airport Restaurant. For more information, call El Presidente Rafael Colunga at (760) 940-0525.

Material Group retirees from Downey and Seal Beach meet at 11:30 AM on the 4th Wednesday of every month at the Stox Restaurant at Imperial Hwy. and Bellflower Blvd. in Downey. Contact Marian Nielson at (562) 429-1020 or Joan Dominguez at (562) 865-7200 or e-mail to *tatedom@aol.com* for information.

Rockwell Vandenberg AFB Retirees Breakfast Club meets at 8:45 AM on the 2nd Tuesday of each month at the IHOP Restaurant in Santa Maria. Contact Marv Bailey at (805) 929-6552 or Al Finlay at (805) 937-3690.

KSC Rockwell KMA Club meets on the 2nd Thursday of each month for lunch at the Florida Seafood Restaurant in Cocoa Beach. Contact Jerry Pruitt at (321) 636-9417 for details.

The Hangar Gang meets at the Proud Bird approximately every 4 months. For time, date and other details, call Gene Salvay at (818) 788-3974 or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

ANNUAL EVENT

Bald Eagles 44th Annual Reunion will be held on Saturday, April 8, 2006 at the Proud Bird Restaurant. Call Val Yarbrough at (805) 646-2283.

Flight Test Instrumentation Annual Reunion meets annually at the Fullerton Elks Club. For information, call Frank Vigil at (562) 691-0236.

Tech Rep Association Picnic – A group of retired Field Service Technical Representatives has a yearly picnic in June at a park in Fallbrook, CA. For more information, call TRA President Rafael Colunga at (760) 940-0525 or e-mail to *rafael@nctimes.net*.

The Annual M&P, P.D.L., "Friends Christmas Luncheon" – This group of retirees and employees have assembled in mid-December for a festive luncheon and gabfest for the past 20 years. Those wishing to participate and receive notice of the next December luncheon, call Fred Koeller at (310) 545-8854.

Grants Pass NAA/RI Retirees Picnic Reunion will be held on Wednesday, September 6, 2006 at Indian Mary Park. Contact Bob Morse for details at (541) 474-1438 or e-mail to *lindabob2@earthlink.net*.

The NAA Paraglider Program – Part II

by Hal Emigh

The Test Program Continues – August Thru December 1964

Don McKusker, who had been a test pilot at the NAA Columbus Division, was brought on board as the next TTV pilot. Don was very active in all the HSTV testing and served as the ground control pilot on most tests. After a couple of weeks, Hetzel returned to the program. He was back on flying status for the Apache and other corporate aircraft, but would not be allowed to fly the TTV. He became a mentor to Don, and assumed the role of the ground communicator for the next manned TTV flight.

Several successful radio controlled HSTV tests were conducted using the High-lobe wing. During these tests it was decided to change the test vehicle lift-off procedure. Using the running take-off with the CH-47, it was difficult to hold the correct air speed during the initial lift-off and climb phase. We devised a method wherein the test vehicle was positioned on its heat shield with a drop-off wheel cradling the structural part of the heat shield. The wing was positioned such that the center keel was resting at a high angle of attack on the top perimeter of the heat shield. We marked the 1,200-foot tow cable in 100-foot and 10-foot increments. The CH-47 was slightly forward of the paraglider and began a slow ascent. Howard Peregrine on board the CH-47 advised the pilot on forward and lateral position with respect to the test vehicle. As the CH-47 slowly gained altitude, I called out the length of cable remaining before lift-off. As the cable became taut, two ground crew members held the wing in position with tethers. Immediately after lift-off, the CH-47 slowly accelerated until the wing was fully deployed and the test vehicle was in a stable towing position. This procedure sounds pretty hairy, but it worked very well during the HSTV tests.

Between August 24 and December 13, 1964, fourteen successful HSTV flights were conducted with the High-lobe wing. Finally, it was decided to try one flight with the T-sail wing. After a successful lift-off, the CH-47, this time with Capt. Watts at the controls, began to circle the lakebed to get to the release altitude and position. To this day we don't know if it was a wind shear or a stray radio command that caused the HSTV to begin a series of violent S-turns. We called for the CH-47 to reduce speed, but too late! Suddenly, the wing separated from the HSTV and the tow cable snapped. This caused the cable to recoil back toward the CH-47. Before the cable could be released from the CH-47, this quarter-inch steel cable came around the CH-47 windshield and up into one of the forward rotor blades. On the ground, I could see that the CH-47 was holding steady but I also heard a strange noise coming from the rotor blades. I called Capt. Watts to see if they were OK. He called the tower for an emergency landing on the South Lakebed, and reported that his windshield was cracked and he was sure he had lost part of one or more rotor blades.

Capt. Watts slowly brought the CH-47 to a safe landing and shut down all systems. We found that on the front rotor one of the blades was missing about two feet of structure aft of the leading edge near the tip of the blade. Other rotor blades had minor damage. We later found several small sections of the tow cable in the swash plate housing on the forward rotor drive mechanism. The Good Lord was watching over us that day. In addition to the Army crew, Howard Peregrine, Harold Roper and a couple of other NAA members were on that flight as part of a training program. Needless to say, that was the end of the HSTV and the controversy over the T-sail wing. We decided to press on and get at least one more manned TTV free flight off before the program ran out of money, and interest by NASA, and many within NAA.

A New Helicopter and Crew

With the damage to the CH-47 and NASA losing interest in the program, NAA contracted a Sikorsky (I think a CH-3) directly from the Sikorsky factory to support the remainder of the TTV flight testing. Sikorsky provided a very capable flight crew who quickly grasped the procedures for lift-off and TTV towing.

Unmanned TTV Flights

Prior to attempting a second manned TTV free flight we decided to verify our lift-off procedure and the controllability of the High-lobe wing with radio controlled flights of the TTV. The TTV had a standard sensitive altimeter, but we had no way of accurately reading altitude below 100 ft AGL in the communications van. To ensure that the pre-landing flare maneuver was executed at the correct height above ground, we attached a cable with a weight on the end of it to the TTV. It was determined that the flare maneuver should be initiated at a 90-foot altitude. Therefore, the length of the cable was calculated such that when the ground control pilot saw the weight on the end of the cable strike the lakebed, he commanded the pre-set flare command. On December 15th and 17th two successful TTV radio controlled landings using this procedure worked well. All touch-down sink rates were within the design limits of a maximum of 17 fps.

Jeff's Corvette Caper

George Jeffs was on-site nearly full time during the month of December. He drove a bright red Corvette and stayed at the Desert Inn motel in Lancaster. One morning, George woke up to find his Corvette sitting on wooden milk crates with all four wheels missing. After reporting the theft, he hitched a ride to the lakebed and continued to "manage the program". Later in December when the Sikorsky pilots were departing for home, as they lifted off they had four tires and wheels attached to a tow line under the belly of the helicopter and called down asking George if he wanted his wheels back. I think George took it in good humor. Never did find the thieves, but he continued to drive the Corvette to Lancaster for the remainder of the test program.

Manned Flight #2

On December 19th with Don Mckusker as the TTV pilot and Hetzel as the ground control communicator, the second TTV manned free flight was scheduled. The lift-off with the Sikorsky went well as did the towed climb to 15,500 feet above the South Lakebed. Don had the helicopter set up conditions to release the TTV. The release went as planned and the TTV achieved a stable glide. With Don and Hetz communicating, Don went through a series of slow left and right turns, and changes in the angle of attack. All was going as planned. Don made a series of S-turns and set up for a straight-in approach to a marked zone on the South Lakebed.

It was agreed that as a backup to Don's initiating the flare from the altimeter reading, we would leave the "flare cable" attached to the TTV. The plan was that Hetz would call "Stand by to Flare" as the TTV was approaching about 200 ft altitude and would call "Flare" just before the weight hit the ground. At about 1,500 feet AGL Don put the TTV into the programmed pre-flare dive to build up energy. All was going as planned. In looking at the instrumentation and radio communications it could not be determined if Don flared on his own or reacted to the "Flare" call by Hetz. It could have been a tail-on gust, but it looked like he flared a little too high. The TTV stalled just above the ground and pitched forward, landing nose wheel first but remaining upright. Immedi-



Photo from the Hal Emigh Collection
Don McKusker being readied for TTV lift off.

ately after touchdown, Don jettisoned the wing. We all approached the TTV with a feeling of limited success in the flight. As we opened the hatch, Don complained of severe back pain and said he couldn't extract himself out of the cockpit. We removed Don while still attached to the seat and rushed him to the hospital.

The good news was that he had motion in all of his limbs and the prognosis was that he had a crushed vertebra. Bad news was that Don was not a tall fellow and he would later accuse us of making him an inch shorter. After a short stay in the hospital and some rehab, Don said that if we could get the program extended he would be ready to fly again. Unfortunately, both NAA and NASA decided that there would be no more funding for the paraglider program. We closed up operations at the lakebed, put the hardware into storage, and all went home for Christmas.

After the holidays, while closing out the program, I decided to look at some high-speed film taken of Don's landing. We couldn't figure out why he got hurt when there was no significant damage to the TTV. I noticed that in a couple of frames I couldn't see him in the cockpit. In the next few frames he was seen in his normal position. On further review we determined that Don's injury was caused by a failure of his shoulder harness. It allowed him to be pitched forward and when he was thrown back into the seat his vertebra was crushed.

We Get a Reprieve

The paraglider team was disbanded by early January 1965. Most of us, including George Jeffs went to the Apollo Program. I became a test project engineer working on vibration testing of the combined Command and Service Modules. I think it was in May 1965 that I got a call from Bert Witte telling me there was some renewed interested in further manned flight demonstrations with the TTV.

Warren North from the NASA/JSC astronaut office had contacted Bert and told him that he had obtained permission for Dr. Robert Gilruth, Director of JSC, to use $1M available from the end-of-year funds to negotiate a fixed price contract for NAA/S&ID to conduct 12 more manned TTV test flights. Warren said that the JSC astronaut office was interested in the type of pilot responses required to fly and in particularly land a paraglider type vehicle. Bert called me to his office to meet Warren. He described the program he wanted. Bert and I told him that this had to be a 100% NAA contract with no NASA direct control and we along with our Q&RA organization would determine the level of safety and inspection to be applied to the program. After several hours of discussion, Warren agreed with the proviso that a NASA observer would be assigned to the program but only as a consultant with no authority to issue directions to NAA.

Next step was to meet with Scott Crossfield, VP of S&ID Q&RA, to get his concurrence on our quality assurance and testing approach. We agreed to the assignment of one QA inspector to cover all aspects of quality assurance and workplace safety.

This sounded like a dreamlike program to me. Bert asked if I would take the program manager's position. I never went back to my Apollo office. I contacted Howard Peregrine, and Don Lien to recruit flight test engineers and technicians. I polled the S&ID engineering department and found a core group of paraglider engineers willing to try it again: Will Owens for flight control and avionics, Ralph Gardner for structures and mechanics, Bob Snodgrass for aerodynamics, and Norm Christensen for project engineering support and about half dozen other part-time engineers familiar with the paraglider. With this basic crew, we put together a program that we thought we could successfully complete within the $1M fixed price contract.

We contacted Sikorsky to try and bring back the helicopter and crew from the previous program. Neither was available, but they suggested that Los Angles Airways might be interested. At that time LA Airways was carrying passengers around the greater Los Angles basin. Their S-61 had the lift capacity we needed. We negotiated a "price per flight" deal with them. They would make one of their S-61s and crew available for each of a series of flight tests at EAFB. At the end of the test day they would be free to return the S-61 to passenger service for the remainder of the day, which they did every day.

The objectives were to complete the program in three phases of operation. Each phase would consist of a six-week period of test vehicle modification and thorough checkout in the Downey area, followed by a three-week period of concentrated flight testing at EAFB. With great support from the contracts and pricing group we submitted the final plan to Bert Witte. He expressed some concern, but with a vote of confidence from Scott Crossfield, he agreed to take the plan to Harrison A. Storms, the President of S&ID. "Stormy" called Crossfield for his input. Scott told him it would be a great chance to demonstrate S&ID's ability to run a small program without NASA direct control, and that he personally would keep an eye on us. Storms told Bert and me that he would sign off on it but if it failed, he would have both our jobs and more. So the challenge was laid down.

Phase I

We had two TTVs and several full scale wings and a lot of knowledge about what needed to be fixed before we were to try manned flights again. The major changes to the TTV were installation of a very sensitive radar altimeter that we could pre-set to initiate flare at a specific altitude. We replaced the F-86 seat with one from an A-4D and added an F-100 stall warning indicator that would sound as the altimeter reached the pre-set flare altitude. I guess we thought we could scare the pilot into performing the flare at the right time. We also beefed up the landing gear, added a VOR and DME for navigational capability on later flights, and replaced the UHF communication system with VHF. We acquired a large trailer from Transportation and outfitted it as our test control and instrumentation center.

To ensure that the wings we had were flightworthy, and to improve on wing rigging and flight control we designed and built

a TTV iron bird that we named the Paraglider Test Bed (PTB). The PTB was equipped with a simple radio controlled flight control system, tow cable fitting and release, and wing jettison mechanisms.

The next thing we had to worry about was test pilots. As stated earlier, Don McKusker was now physically fit and ready to sign up again. A Pratt & Whitney test pilot named Jack Swigert had contacted Scott Crossfield to apply for the paraglider test pilot job. Jack had heard about the program through the NASA astronaut office. It seems that Jack had gone through the astronaut candidate process twice but was eliminated each time in the final selection. He was approaching the age that would totally eliminate him and he wanted to gain NASA visibility through our program. So now we had two pilots. Both participated in all three test phases.

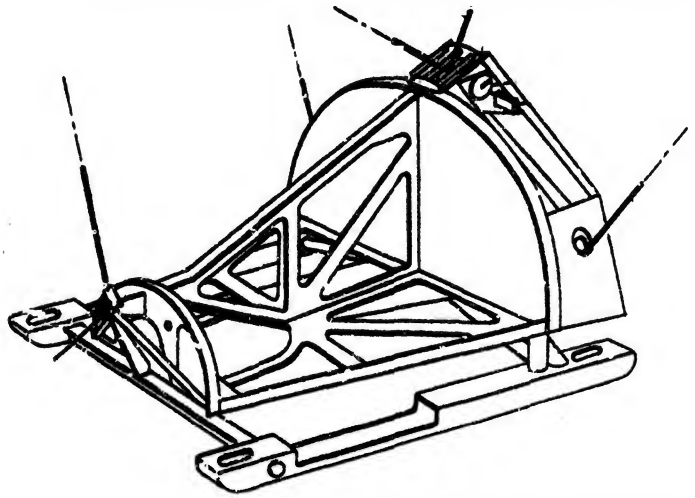
During the period of June 30 to July 17, 1965 we conducted 14 flights of the PTB and three radio controlled TTV flights. The PTB verified cable rigging of all available wings and provided very thorough training for the flight and ground crews at the test site. It also enabled us to narrow down to two wings that we would utilize on the TTV tests.

On one of the TTV tests, prior to lift-off, the tow cable broke off the wing inflation fitting, causing a leak. The other two were considered unsuccessful. One, because the radar altimeter locked on the nose landing gear causing a high sink rate at touchdown, and the other because the flare command was cancelled by a subsequent control maneuver given by the ground controller. This was not a good start to a fixed price program, but we were optimistic and knew what fixes we had to make.

Phase II

After the down time at Long Beach to repair all of our test articles and upgrade our test control trailer we were ready to head out to EAFB again. During the three-week period of August 24 to September 11, 1965, we conducted two more successful PTB flights, two TTV radio controlled flights and six manned TTV flights. Don and Jack alternated as pilot on the manned flights. The radar altimeter solved the flare altitude problem-with the help of the F-100 stall warning.

One of the unmanned TTV tests was aborted due to a pre-lift-off command sent to the tow cable release. One of the manned flights, with Jack Swigert aboard was aborted right after lift-off due to the wing forward pitch cable becoming entangled with the radar altimeter shield. Between Howard Peregrine in the S-61 and myself on the ground, we talked the TTV gently back to the lakebed on its heatshield with no damage. I asked Jack how he



Drawing from the Hal Emigh Collection

Full-Scale Tow Test Vehicle (TTV) Iron Bird



Photo from the Ed Rusinek Collection

Manned TTV on final approach at Edwards AFB.

was doing. He said, "Let's check the battery voltage and go again." Two hours later we had a successful flight.

A relatively high sink rate was obtained on one of the TTV flights because of a head-on wind shear or gust encountered immediately prior to the flare maneuver. However, this test phase was considered successful in that five of the TTV flights produced sink rates of between 11 and 19 feet per second. We were now a little behind schedule and a little over budget but again full of optimism.

Phase III

Back at Long Beach we had very little test vehicle repair work to do. We concentrated on detailed flight events planning for the next series of manned TTV flights. We wanted to ensure that we reached our goal of twelve flights but also wanted to get the kind of data that Warren North was looking for. We rigged the TTVs with a device so that Don and Jack could sit in the TTV in the hangar and actually go through flight sequences with the TTV systems fully active. The key was to get timing of maneuvers right to ensure that they could land in the designated touch down zone.

During the period of October 25 to November 5, 1965, eight successful manned TTV flights were conducted with Don and Jack alternating. Each flight expanded the flight envelope, exploring angles of attack, S-turns, complete 360-degree turns and attempts to spot land on the lakebed. By this time NASA had observers at the test site and was very impressed with the operation. On one occasion we were about ten minutes late in lift-off. Jim Chamberlin, I think then Gemini deputy program manager was standing next to me and I jokingly apologized for the late schedule. Jim's reply was, "NAA is showing us how to run a flight test program."

Jack was scheduled for the last flight. Up to that time we had never been able to hit within a small-designated landing zone. Jack was aware of the sizable party of NASA observers and was determined to make a good landing. He practiced in the hanger until late in the evening the night before the flight. The weather was great on the morning of November 5th as we started the pre-flight procedures.

The NAA Paraglider Progtam *(Continued on Page 9)*

Taming The Hun

by Jack Bailey

I thought that the F-100 Super Sabre, known as the Hun, was the most beautiful airplane I'd ever seen. In 1953, I was an NAA tech writer in Field Service. We were updating the flight control section of the Air Force Maintenance Handbook for the F-86 and the F-100 with more elaborate illustrations so I had a chance to get "up close and personal" with the F-100A.

I've had experience with Grumman Wildcats and Hellcats in the Pacific during WWII and I had worked in production at Douglas and Northrop after the war, but the F-100 "Hun" was the first supersonic jet I've ever had my hands on and she was lovely to look at. I made up my mind, I wanted to go out in the field with this bird when it was delivered to the USAF Tactical Air Command.

I did manage to get into the NAA Field Service school, but only for the F-86. Well, that would get me out in the field, and that was something. In the Spring of 1954, I became the sole survivor of a tough mid-term exam which wiped out the entire class of F-86 tech rep trainees.

John Casey, the Field Service Manager, resolved my problem by shoving me into the on-going F-100 training class on a sink or swim basis. I didn't sink, so in August of 1954, I went off to George AFB, at Victorville, California, on my first tech rep assignment, with the 479th Fighter Day Wing—the first recipients of the F-100A. Many names from those early days come to the fore: Gordy Rymal, Eddie Collins, Jay Akers, Wes Wright, Bob Wiley, Jim Armitage, Hulon Shows. Who have I missed? Some are gone now, but I have fond memories of all of them. At George AFB, Tom Mackin was the Rep-in-Charge and the group included Rex Peterson, George Engle, Jim Stuart and several others whose names escape me now.

The 479th was a former F-86 outfit, with a lot of MiG hunters who had flown in Korea. They eagerly awaited the arrival of the new bird, the Super Sabre. The transition from F-86 to the F-100A was reasonably smooth, but the pilots did complain about the sensitive longitudinal controls which tended to induce the pitching, called the JC, or Jesus Christ, maneuver.

One afternoon, one of the pilots taxied in and waved me over to his airplane. I climbed up and he showed me the numerous paint marks where his helmet had hit the canopy. He was unable to accurately describe exactly what had happened but it appeared later that he had experienced the same kind of inertial coupling which would later claim the life of NAA test pilot George Welch and ground the F-100 for the rest of 1954.

I sent off a report and called the incident in. As I recall, several engineers visited the base to speak with the pilots. Subsequently, the F-100A was retrofitted with a larger vertical stabilizer, similar to that which was on the prototype.

About the time the grounding order was lifted, in the spring of 1955, I was sent to Foster AFB at Victoria, Texas, where the 450th Fighter Day Wing was awaiting the arrival of the F-100C, an optimized fighter-bomber version. Tom Fleming was the Rep In Charge with Rollie Jones, Don Rumple, Stan Nash and L.C. McGinnis among the F-100 tech reps in the group.

The transition into the F-100C at Foster wasn't as smooth as the George AFB experience. We lost the first bird when a pilot panicked over some minor glitch and ejected. The airplane went straight in behind a cotton gin not too far from the base. The pilot was uninjured but asked to be removed from flight status. He felt the airplane was simply too much for him.

Tom and I went out to examine the wreckage but there wasn't enough left of the airplane to make any determinations. The Flight Safety people who came out from San Bernardino called it pilot error. I remember Tom trying to use the phone in the cotton gin to call the accident in to Casey in Field Service. There was so much noise,



Photo courtesy of the AFFTC History Office

The Super Sabre YF-100A-1, Aircraft No. AF52-5754, flown by "Wheaties" Welch on its maiden flight to be the first jet aircraft to break the sound barrier in level flight.

they had to shut down some of the machinery so Tom could hear.

We lost the second airplane shortly thereafter when the pilot ejected on climbout after take-off, when his cockpit filled with smoke. He landed in a graveyard, had trouble spilling his chute, and sustained numerous contusions from being dragged through the tombstones.

The F-100 was another story! The airplane continued to fly, unmanned, over San Antonio, 90 miles to the north. There, it did a 180° and headed back toward the base. There was some discussion about having the Air Defense Command launch an interceptor to shoot it down. The F-100 passed over the base, rolled and dove straight into the back yard of a sergeant's house, located across the road from the field. The sergeant and his wife were blown from their kitchen and out the front door by the concussion of the exploding bird, but weren't injured. Fortunately, the burning fuel was directed away from the house by the angle at which the airplane went in and the house was spared.

The immediate aftermath of this crash was a comedy of errors. The battery bounced out of the base fire truck as it crossed a pasture to reach the flaming wreckage. The truck stalled and the battery had to be reinstalled before the truck could fight the fire. I might mention here that the Foster AFB Fire Department was a civilian operation and the Chief, a fairly young guy, was not the longest hose on the truck, to coin a phrase. I did notice, however, that he managed to stay quite close to the young wife of the elderly Senior Pratt and Whitney rep.

After the fire was finally out, several enlisted airmen were sent into the crater to retrieve whatever they could find. While they were in the hole, which was probably fifteen feet deep, the backhoe which was being used, struck a 20mm cannon barrel. The resulting spark ignited the JP-4 fumes and a fire flared up with a loud whoosh. Luckily, the airmen got out just in time.

On the J57 engine, it was necessary to drain the rear bearing sump periodically by removing a screw-on drain line cap. The flight line crews were cautioned repeatedly by both the North American and Pratt and Whitney tech reps to be sure to replace the cap after the draining was finished, because all the oil could be lost. There was always someone who didn't get the word. A cap was left off one of the airplanes during pre-flight inspection.

The pilot of that airplane radioed in from the Houston area, about a 100 miles east of Foster AFB, that he was experiencing severe engine roughness. He said he thought he could bring the airplane back and requested that the field prepare for an emergency land-



Photo courtesy of the Boeing History Archives Office

The sleek and elegant Super Sabre F-100C-25, Aircraft No. AF 54-2099.

ing. On his final approach, the engine quit but he was able to land the airplane, going partially off the runway.

Everyone, including the Base Commander, rushed out to the airplane. Major Don Page from Flight Safety in San Bernardino was visiting that day. He and I went out to the airplane together. People were climbing all over the bird when we got there. Major Page and I both noticed an extraordinary amount of heat emanating from several fuselage vents.

Major Page gave me a boost, and being young and foolhardy, I crawled up the intake duct to have a look. I crawled over the hump in the duct to find the front of the engine on fire. The J57's magnesium accessory section was burning with a blue-white flame. It looked like someone welding back there. Molten drops had already penetrated the skin of the airplane. I scrambled out, grabbed a fire retardant line from the nearby fire truck, crawled back in and tried to open the valve on the nozzle. It was corroded shut. Probably wouldn't have done any good anyway.

We got all the sightseers off the plane by telling them it was on fire. Very effective! We finally convinced the confused fire chief that his only option was to quench the fire with lots of water. That seemed to work. With the fire apparently out, the airplane was parked overnight in the base maintenance hanger.

In the morning the engine was pulled out for inspection. When one of the maintenance guys started to dig around in the magnesium, it flared up again, hotter than ever. Good thing that hadn't happened during the night. The F-100C still had over half its fuel aboard and there were several other airplanes in the hangar.

All went well for several months until an F-100 flamed out on final approach and pranged, wheels down, in a field, injuring the pilot and totaling the airplane. A week later, an identical accident occurred, only this time the pilot got the gear up before he hit the ground. The airplane skidded a long way on its belly but stayed together.

The company sent an engineering team down to conduct an investigation. An Air Force Flight Surgeon got in the act and insisted that the pilots had experienced monoxide poisoning and had blacked out. The rest of us suspected a problem in the fuel system. Both planes were very low on fuel when they went down.

We got the gear down on the damaged F-100 and patched up the airplane just enough so we could run it. We repaired the ripped rubber fuel cells with pieces of aircraft inner tubes and glue. When we got the airplane running, we all took turns sitting in the bird, canopy closed, for long periods. No one blacked out.

To mollify the Flight Surgeon, we took cockpit air samples with evacuated containers. No CO was detected. However, the Flight Surgeon sat in the cockpit for a few minutes during one of the runs and complained of feeling "woozy". That's a medical term for having your head up your rear end.

It was finally determined that the seal on the inverted flight tank was allowing the system to suck air when low fuel levels uncovered the tank. A fix was immediately incorporated on all F-100s and that particular problem never recurred.

After Texas, I was sent back to George AFB as Rep In Charge. I reported to John Henderson, who came up to the desert several times to see how things were going. North American had a large group of very capable reps and technicians at George and the F-100 operation had become almost routine.

In the Fall of 1956, John Casey sent me off with a team of reps and technicians to TAC Headquarters at Langley AFB where the fighter wing was scheduled to receive the F-100.

Art Forster, one of the team members, located a duplex at Buckroe Beach in Virginia which was fortunate because living accommodations were quite sparse. My bride of three years was demoralized by some of the chicken coops the locals were trying to rent. Beach living, with an endless supply of cherrystone clams was an added bonus to this assignment. Arnold Marcum was the company's

TAC representative and was very helpful in making the F-100 transition a smooth one.

For the first time, we were dealing with pilots and crews who had cut their teeth on the Republic F-84. They weren't the North American type of guys and there was a detectable aura of reserve not found with F-86 units. Despite this, we and the F-100 won them over.

The only blemish on the operation while I was there was the loss of one airplane. The pilot was unable to recover from a flat spin and bailed out over Hampton,Virginia. The airplane stayed in a flat spin all the way to the ground, slamming into a school yard, moments after the conclusion of recess. Somebody up there was watching over those little kids.

No one on the ground was injured but the pilot sprained his ankle, as I recall. Fortunately, and miraculously, there was no fire when the bird hit the ground...so hard that the wingtips were tilted up at an odd angle.

This accident precipitated a company investigation into various recovery techniques used in response to flat spins. I believe it was generally concluded that the F-100 could not recover from a flat spin and the best technique for the pilot was to punch out.

In the Spring of 1957, John Casey informed me that there was an opening in the North American office at Wright-Patterson AFB in Dayton, Ohio. I took the job, under Stan Chase, with some reluctance because I had been very happy as a tech rep and I liked working for John.

I look back on those days on the NAA firing line, with great nostalgia. I still have that cherished gray badge. The disappearance of a once proud company makes me very sad.

About the Author: Completing aircraft mechanic school at NAS North Island in San Diego, Jack was assigned to Torpedo Squadron 2 aboard the U.S.S. Lexington until the ship was sunk in the Coral Sea Battle in 1942. He remained in the South Pacific two more years, working on F4Fs, F6Fs, F4Us, SBDs and TBFs. Graduating from USC with a degree in English, Jack came to LAD as a Field Service technical writer and became a tech rep. Following a move to Autonetics in 1960, he managed the Western Region Field Offices and then moved on to the NAR Corporate Office. He returned to Autonetics in 1967 as a Project Manager on the F-111 program. In 1968 he published his first fiction novel "The Number Two Man". He left the company in 1969. Jack currently resides in Studio City, CA with his lovely wife of 52 years, Wanda.

The NAA Paraglider Progtam *(Continued from Page 6)*

Everything went as planned from lift-off to release at about 15,000 feet. Jack followed the flight plan right down to the second. As he came in on final, and started the pre-flare dive he said that anyone who bet against him hitting the spot was going to lose. As photos indicated later, when the TTV came to a stop with wing jettisoned, he was sitting exactly in the middle of the marked landing zone. This called for a celebration that night and later back at Downey. As we now know from Apollo 13, Jack gave NASA the impression that he wanted.

In Summary

When the books were finally closed on this program, we had met the schedule, accomplished nearly all the flight objectives and made a very reasonable profit on this fixed price contract.

My next assignment was in the advanced programs area at S&ID as a project manager for advanced re-entry and recovery systems studies. We did continue to try to sell paragliders for unmanned military equipment delivery systems to troops on the ground. The development of the current highly efficient gliding parachutes ended the paraglider concept. A NASA LRC funded Deployable Rotors Recovery Systems Study was one that led me back to the lakebed a couple years later (another story).

In the late 1960s, NASA/Langley cancelled our deployable rotors study and told us to prepare for a new program. The program was called Advanced Reusable Space Logistic Vehicle. S&ID formed a small group and captured one of the $500K study contracts. This effort later evolved into a program call Space Shuttle. It was the beginning of another part of my great career at NAA.



Photo from the Hal Emigh Collection

Test Engineers and Technicians



Photo from the Hal Emigh Collection

Engineering and Management Team

Unmanned Satellites at Seal Beach – The Early Days

by Dr. Kyle Vaught

The Move to Seal Beach

In the late 1960's, North American Aviation Space Division in Downey was dedicated to the Apollo program. But, Stan Crane was bringing together a group of engineers and scientists to pursue other space programs. He hired Curt Zoller to recruit some people to bring into this business. Zoller's philosophy was, "Hire good people and the business will follow." In early 1970, this group moved to Building 80 in Seal Beach. One segment led by Les Dean, was pursuing a replacement for the DSP program. (This replacement still hasn't taken place, but Lockheed Martin is currently working on it with the SBIR Program (Space Based Infrared) now projected to cost ~ $10B and launch sometime late in this decade.)

It was clear that the future of surveillance satellites would go to sensor arrays rather than the single detectors used by the DSP (Defense Support Program). However, this mosaic array technology was just being developed. There would be many false starts. A group under Bill Dixon captured a DARPA (Defense Advanced Research Program Agency) sensor program, the RM20B, to demonstrate that silicon array technology could be built and successfully flown in space to springboard this revolution.

DARPA's charter was to push technology for the Department of Defense and operated on a philosophy that if more than half of their programs succeeded they weren't being aggressive enough. Another group was doing studies for NASA on advanced communication, space colonization, mining the moon, and other ventures that still have not taken place over thirty years later.

One of the people hired by Curt Zoller was Al Myers, a young Captain out of the Air Force Space and Missile Systems Operations (SAMSO). Al went after a Satellite Inspection Study for the Air Force. This was about the time that NAA and Rockwell merged. I had been working on Minuteman III and Advanced Missile Systems at Autonetics in Anaheim and joined Al's group during the proposal stage. In early 1970 we submitted the proposal and won the study.

Proposal preparation was totally different in those days. Everything was done by hand... no computers. Well, there were computers. Building 80 held a whole floor of IBM mainframe computers. But these were for financial calculations and heavy scientific analysis. You submitted your program line by line on green-sheets that were coded by keypunch operators. This produced a bunch of punch cards that were then submitted to the mainframe, run and returned with a list of your errors. A typical run took a day. To get a program written and debugged typically took weeks.

Proposal preparation was done by hand. Text was written up long hand and typed by the typing pool or the secretary. Figures were created by the program artist (augmented by the art pool for big jobs like proposals). The finished paragraphs and art were produced on heavy stock and pasted up into pages of proposal material. When the proposal was over page count, you had to go through and cut out lines and lay everything out again. To get the Satellite Inspection proposal to the Air Force by the deadline we literally took all the material to the printing shop across town and worked all night laying it up, editing it, and tuning it to fit in order to prepare it for print. Artwork included all figures, pictures, graphs, and illustrations. Getting artwork that told your story well, required good relations between engineer and artist.

Fortunately, we had an outstanding young artist, Noel Burley. He had already done things like going to the Cape to create a picture of the Saturn launch vehicle looking down from the top of the gantry. Heady stuff considering this was the tallest launch stack every created... even today. Noel was very well organized. When it came time to layout the proposal pages he had every piece of art (latest version) in folders ready to place in the correct page layup.

The Satellite Inspection study involved some new concepts, for space. Two young instrument scientists involved were Dr. Larry Kull and Dr. J. Robert Beyster who had recently founded SAIC. SAIC is now a major national aerospace company.

P72-2

In late 1971 Al Myers decided that although studies were interesting, it would be good for us to go get a real hardware program. He found that the Air Force, Space Test Program office was putting together a satellite program to fly five technology experiments. One of these was the RM20B sensor being developed by Bill Dixon's group. We put together a proposal and won this program. At the time, most of Seal Beach was involved in supporting the Saturn Stage II program for NASA and didn't know our group existed. So, it came as a surprise that we had won a hardware program for the Air Force.

The figure below shows the P72-2 satellite. Its unusual configuration was dictated by requirements of the payloads it was to fly. At the time the satellite contract was awarded; the two primary payloads, the RM20A and RM20B sensors were well into their development. The RM20A is the large sensor at the left end of the satellite. It was designed with a sensor on one side, a cryogenic radiator at the other, supported only by the post at the center and had to be free to rotate for an unobstructed view of the earth. The RM20B sensor was mounted on the right end of the satellite. It too required an unobstructed view of the earth and cooled it's infrared detectors by a cryogenic radiator that was mounted on the back side of the satellite and had to be protected from heat from the sun, earth and any part of the satellite. There were also three other payloads that had to be accommodated by the satellite design.

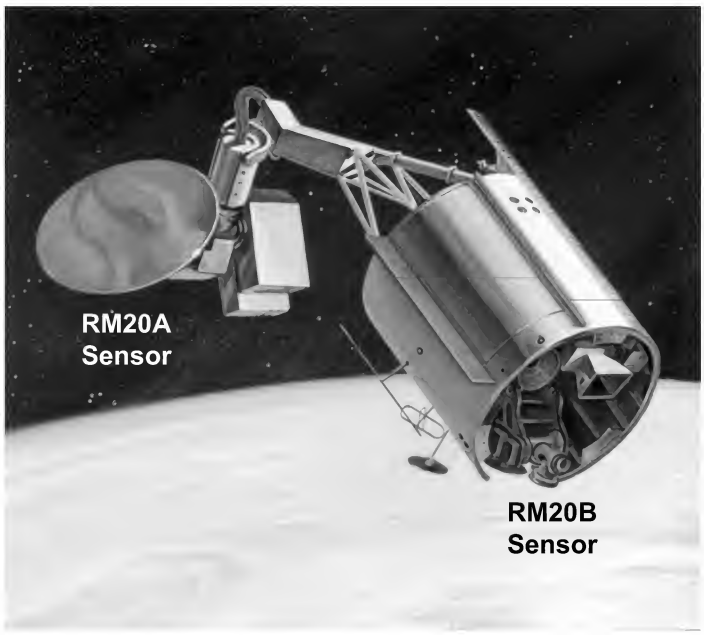


Illustration courtesy of Dr. Kyle Vaught

Rockwell's first unmanned satellite – P72-2 orbit configuration

The satellite was designed for a low altitude, twilight, sun-synchronous orbit. This orbit kept one side toward the sun for power and the other to cold space for radiative cooling. The satellite was momentum stabilized by a unique configuration of two momentum wheels canted into a "V". This unique "V-Wheel" configuration engineered by Dr. Frank Barbera provided a momentum to keep the satellite oriented in the orbit plane but also allowed control and damping when the sensors slewed.

Rockwell management took an active interest in the program. George Jeffs, then head of Space Division, and Dick Schwartz head of the Seal Beach operations sent almost daily notes with suggestions and concerns.

This program had its challenges. At the time there was no satellite factory at Seal Beach. Building 82 was only an open warehouse. So, the decision was made to build the satellite and integrate the payloads in one of the labs on the first floor of Building 81. Ceiling height was only about 15 feet and there was no overhead crane so a satellite fixture was designed to hold, move and rotate the satellite during assembly and test. This worked reasonably well except when the transport fixture collapsed during transport to the acoustic chamber at TRW. No serious damage was caused and the fixture was reinforced.

The cylindrical design, typical of booster stages, turned out to be an awkward design for a satellite. Rectangular electronic boxes had to be mounted on pie shaped internal shelves and heat conducted to the outer skin by heat pipes. Curved ammonia heat pipes (a unique design) were used to spread this heat over the cylindrical skin.

The satellite had three tape recorders to store data from the experiments and the satellite. On one occasion a tape recorder failed to stop on rewind and ripped the tape off the reel. Not a good thing if it happened in space! The command sequence that led to the failure was isolated and prohibited. Even so, during repair of the first recorder the same thing happened to the second recorder. The problem turned out to be in the recorder command logic circuit. All recorders had to be modified.

The program was threatened at one point fairly late in the program when it was discovered that the RM-20A sensor had no constraint to keep it from rotating during launch (a little interface misunderstanding). An intensive effort by Rockwell and Lockheed, led by Don Kerr, developed a releasable attachment between the sensor and the supporting truss structure.

One experiment, developed by a university lab, was delivered with the baseplate hogged out in a waffle pattern. They had done this to get the weight within their requirement. It saved the weight but reduced the conduction path for heat out of the box. In the end the waffle holes were filled with conductive epoxy.

At the launch site, during preparation of the satellite, thrustors were accidentally spiked by high gas pressure. This caused leakage of the thrustors and led to an emergency refurbishment and replacement of all thrustors.

Launch was from Vandenberg on a refurbished Atlas F. The Atlas F was an ICBM that was removed from its silo and refurbished for space launch. The Vandenberg Atlas F launch team had 44 successful launches in a row. They were critical of the satellite but quite confident of the launch vehicle. Unfortunately, at launch the two strap-on solids fired normally, but the main liquid stage failed to ignite, dropping the satellite into the Pacific Ocean... a frustrating end to 3 1/2 years of intensive efforts. However, this first unmanned satellite built by Rockwell was a success in many ways. The P72-2 satellite program cost only ~$12.5M, well below the normal Air Force satellite cost to weight curve; was developed in shorter time than most satellite programs; and led the way to the GPS satellite program. This program was also a gateway to the technology and space experience that led to the win of the P80 and Teal Ruby programs later.

AFSATCOM II

In 1974 Rockwell bid on the AFSATCOM II (Air Force Satellite Communications) Phase A Study led by Elliott Merbach. There were two other bidders, TRW and Hughes. Both Hughes and TRW had a long history of building communication satellites, so it was a big surprise to many when Rockwell and TRW were selected and Hughes was not. Much of the credit for the surprise win goes to Gene Freeman. He went to the companies in the US that were doing innovative things in communications (except TRW and Hughes). Raytheon who was doing advanced EHF transmitters, Linkabit had breakthrough coding, Collins knew military ground and aircraft communications, Boeing was the leader in survivable facilities, etc. Gene told each of them that all these other companies were on our team. That was a stretch at the time, but they all joined and together provided a unique capability. Dr. Jacobson founder of Linkabit and Andrew Viterby (famous for the Viterby decoder) were there. They later established Qualcomm based on their advanced spread spectrum coding technology work. At Rockwell, Dr. Francis Nakamoto, a new Ph.D. from USC, was soon extending this work.

The one-year studies provided a complete architecture for an advanced, survivable, secure satellite communication system. At the end, the Rockwell team was funded for several one-month studies to answer special questions – "Why not use a large low-altitude constellations?" – "How about defended satellites?" etc. Then the effort was not funded by Congress for the next year. The Rockwell team disbanded. Vyts Jusionis and Fernando Niebla started their own companies. Fernando's company, Infotec, later became California Minority Company of the Year.

A year later, when the Air Force announced the new Milstar program, Rockwell was not able to reestablish a team. Milstar satellites were built by Lockheed with payloads by Hughes and TRW and cost ~$1B each.

GPS

GPS should have a separate article all it's own, but here is a snapshot. The Global Positioning Satellite (GPS) program established Rockwell as a major player in the unmanned satellite business. Through the first three phases Rockwell built 40 satellites. These created the network of precision clock and navigation signals that established GPS as the international utility for navigation and time standard. It is one of the most successful Air Force satellite programs ever.

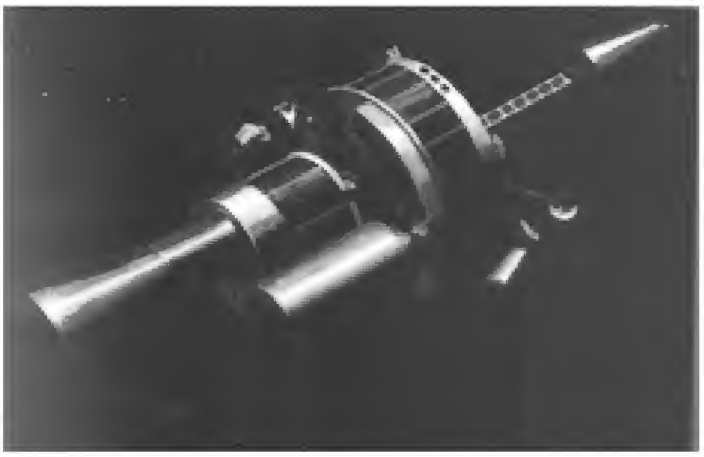


Illustration courtesy of Dr. Kyle Vaught

One of the most complex concepts for AFSATCOM II

In 1973 Dick Schwartz decided to compete for the GPS program. This was a bold step since two other companies had already completed Phase A studies. Nevertheless, with an outstanding effort, Rockwell won the Block I contract. Many people were responsible for this. Al Myers provided key strategy and knowledge of Air Force programs, and Hugo Fruhauf was over at Air Force/Aerospace every week showing them our latest concepts. A key to GPS was the atomic clock. No one had ever built an atomic clock this small and of space quality (Hugo later went to head Efratom, which built the atomic clocks).

Many of the key leaders were pulled from the P72-2 program to lead efforts on GPS. Frank Barbera, chief engineer; Jim Ashley, systems test; Don Kerr, Mechanical; Tom McClintick, thermal; Ray Miller, power and many others. This contract was to build 6 satellites to be flown in a group to test and demonstrate the system. Satellites 7-11 were added and upgraded to carry the NDS (Nuclear Detection System) secondary payload to detect and precisely locate a nuclear burst anyplace on earth.

It's hard to believe now but every year it was a fight to keep the program funded. The Air Force would leave GPS out of its budget and Congress would put it back. Satellite 12 was developed to transition to the operational system. Then under Division President Bill Strathern, Charlie Helms led the proposal for the production contract. This contract was awarded for 28 production satellites to complete a 16-satellite constellation providing global, all weather, precision navigation and spares.

This $1.2B, Firm-Fixed-Price and multiyear funded contract was unique in Air Force Space programs. It was the largest satellite contract ever awarded by the Air Force at that time. To get this contract the cost of parts and satellites were reduced to less than 50%. Not all suppliers stepped up to this challenge and some were replaced. However, those that did all made money on the contract and it has become arguably the most successful Air Force satellite program ever. The program achieved all performance and cost goals. Satellites designed for 5 and 7 years life, lasted an average of 11+ years (one is over 15 years and still working successfully) and exceeded all navigation accuracy goals.

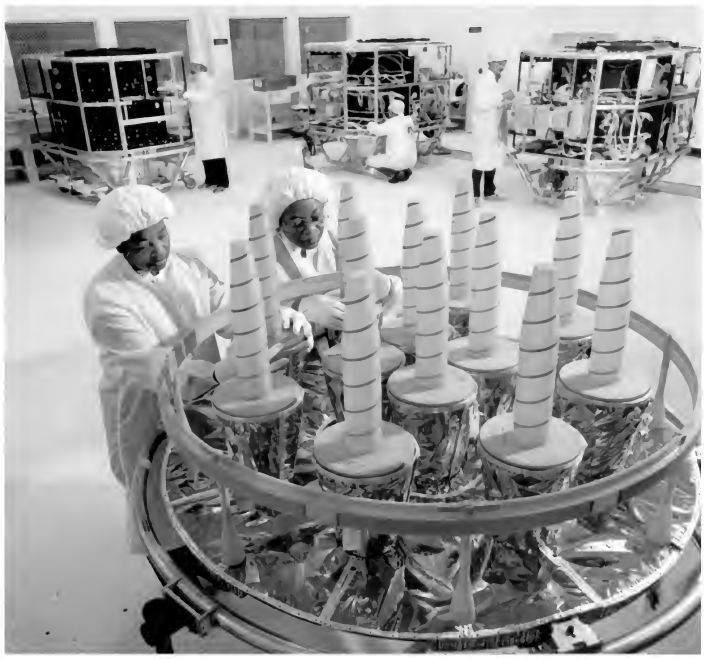


Photo courtesy of Dr. Kyle Vaught

GPS Satellite Production

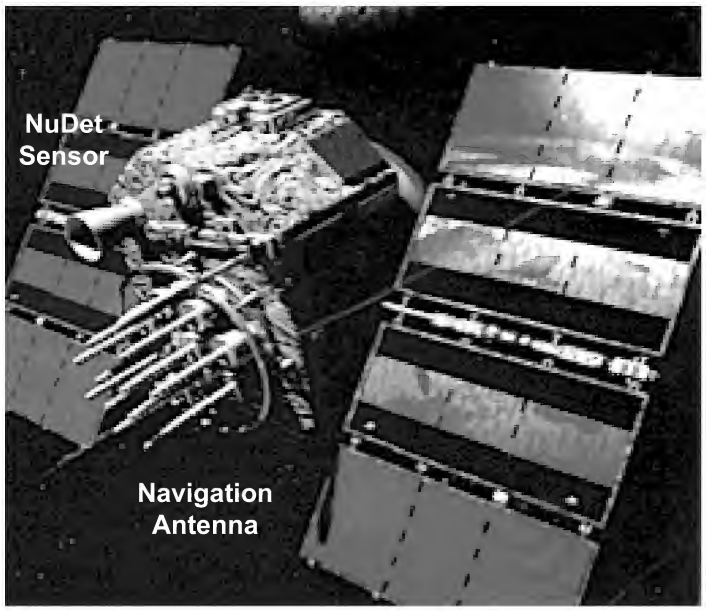


Illustration courtesy of Dr. Kyle Vaught

GPS Block IIA Satellite

Lockheed-Martin won the GPS IIR (replacement satellite) program. Then, in 1994, Rich Arras led a Boeing team that successfully recaptured the program with a win of the next phase, GPS IIF.

Acronyms

AFSATCOM II	Air Force Satellite Communications Program II
Atlas F	A ballistic missile launch vehicle refurbished for space launch
DSP	Defense Support Program
GPS	Global Positioning System
NDS	Nuclear Detection System
NuDet	Nuclear Detection
P72-2	An Air Force Space Test Program satellite carrying the Teal Ruby Sensor
P80-1	An Air Force Space Test Program satellite
RM20A	A state-of-the-art infrared sensor built by Lockheed
RM20B	A state-of-the-art infrared sensor built by Rockwell
SBIR	Space Based Infrared

I thank Rich Arras, Frank Barbera, and Bill Spencer for help in remembering some events and names. Of course, all errors are mine.

About the author: Kyle Vaught joined North American Aviation on the Minuteman Missile program, then moved to satellites and spent most of his career in satellites at Seal Beach. He was chief engineer for Rockwell's first unmanned satellite (P72-2), program manager for satellite programs (AFSATCOM II & P80), Chief Engineer of the Satellite Division, Director of Advanced Surveillance Programs, P80 and Teal Ruby, Advanced Technology and Space Electronics, Satellite and Strategic Systems Engineering, and Vice President and Program Director for Rockwell's Space and Missile Tracking System (Brilliant Eyes). Since retiring from Rockwell in 1995 he has consulted on many satellite programs at Boeing, NASA, and others. He also created a Masters level course in Space Systems Management for the University of Michigan and taught it for eight years.

The Poet's Corner

The Quest To Go Beyond

Space, the heavens, has always been
Mysterious and beckoning to man.
Ages ago balloons were to be seen,
Then motorization soon began.

The Wright brothers made a successful flight
At a place that was called Kitty Hawk, N.C.
They thought no one would ever fly at night,
But they were wrong, as anyone can see.

As early as the conflict called World War One,
The airplanes was found a useful war machine.
By the time World War Two had begun,
Vast improvement of the craft were seen.

They aided greatly in our effort for victory,
And shortly after, began that race for space.
The Russians were the ones to start the story,
But soon the USA began a rapid pace.

Yes, the USA got off its duffer, very soon;
Now the tale moved to magnificent height.
Quickly men had traveled to the moon,
Their journey there in both day and night.

So great the tale in those heroic deeds,
Yet behind it all was scientific exploration.
What could be used to provide for their needs,
And for those assigned to the space station.

So many discoveries were made on earth
To help them make discoveries in the outer blue.
Greater by far than this tiny globe's girth.
Are all the mysteries out in the heavenly hue.

We have sent unmanned craft to Mars,
And other planets such as Mercury and Neptune.
You could never explore them with mere cars,
So space exploration had to sing a different tune.

But why do we see it faltering or failing?
It seems to have slipped into lower gears.
Instead, into the azure blue it should be sailing,
Casting aside any accomplishments or fears.

Now that so many things have been discovered,
Is probing space to fall beside the way?
Does our nation think there's naught to be uncovered?
That now comes twilight, the close of the day?

L.B. Strawn
Poetman99@aol.com
January 10, 2006

Contrails From The Past

by Ed Rusinek

Dear Ed,

I was assigned to work with Frank Compton on the preliminary design of the Vigilante. When it was time to "go on the road" to sell the Navy on the system, we put together a briefing using flip charts. Frank had the idea of joining the individual charts into a roll. He made an easel with motor driven rollers top and bottom. By pressing a switch on a pointer, the motors would roll the charts forward or backward. We went to Inglewood to brief "Dutch" before going to the Navy. Frank gave most of the briefing but gave me the pointer for the avionics charts. Whenever, we pushed the button, the rollers would squeak as they moved to the next chart. When we finished, "Dutch" said, "That's a good system you have put together, we should sell some airplanes. But, before you go on the road, either oil that damn thing or teach it to play "Anchors Away."

—Jeff Schmidt, King City, CA

Dear Ed,

It was very nice to read the article about the B-21 and the B-28. I had forgotten that they both were named "Dragon". I worked in Experimental—later renamed Flight Test—in Hangar 1. At the time, Jim Armitage was the foreman and I was a flight line mechanic. I pulled the chocks on that last flight of the XB-28. How Bob Chilton and Roy Ferren got out always amazed me—it was very tight quarters.

—Ed Collins, Palos Verdes Estates, CA

The Discovery Science Center Needs Help!

The Discovery Science Center located adjacent to the 5 Fwy in Santa Ana urgently needs your help. An 85-foot tall Delta III is being erected at the Center and a Space Shuttle replica is being relocated to a location in front of the facility.

The Center is looking for volunteers to upgrade the Shuttle and protect it from the elements. It is also in need of volunteers to prepare presentations explaining the Delta and Shuttle systems to visitors.

The requirements are simple:Ability to have fun and a desire to work with others to help children learn about science and technology. For more information, call or e-mail Steve Kight at (714) 913-5015, *skight@discoverycube.org*. There is no pay but a lifetime of thanks from the kids and the community!



Photo © The Discovery Science Center

The Silent Majority

by Stan Guzy



RUUD, RALPH H., 97 – a virtual titan of the aviation and aerospace industry passed away in Valencia, CA on February 16, 2006. A Norwegian immigrant, Ralph Ruud joined the Tooling department on August 1, 1931 at General Aviation Manufacturing Company, a predecessor of North American Aviation, Inc. He was one of the original Bald Eagles that joined "Dutch" Kindelberger in the trek from Dundalk, Maryland to California. In a career that spanned 60 years, he held many positions including Chief Tool Engineer, Assistant Superintendent, Corporate Vice President of Manufacturing, Vice President of Space Division, and Senior Vice-President of Operations for Space Division. His service stretched from wood and wire biplanes to moon exploration. He took final retirement in 1994. Ralph Ruud is survived by his loving wife of 75 years, June.

ALMAN, JARVIS "AL", 89 – passed away in Carmichael, CA on December 11, 2005. He retired from Rockwell International after 36 years of service. He was a field service rep on the F-86, F-100 and the T-39 for 23 years.

BERNARD, NATHAN "BUD", 93 – passed away on October 17, 2005 in Culver City, CA. Bud joined NAA in 1940 and retired about 1979. He was a section leader in the Production Development Lab on the X-15 program and participated in quality assurance and manufacturing development at LAD, Palmdale and Seal Beach. He is survived by his wife of 70 years, Nita.

BLASER, PETER J., 89 – of Venice, CA passed away on January 5, 2006 of natural causes. Peter started at LAD in 1950 on the flight line as an inspector and retired from Pricing in 1984 with 34 years of service.

BREHL, ALBERT W., 84 – died on November 6, 2005 in Columbus, OH. He retired from the Columbus Division in 1978 after 28 years of service. Having a long career in aerospace instrumentation, he had twenty years service in the Management Club Clown Unit as Raggedy Andy, entertaining children, seniors, veterans and others in need of cheer.

BURG, JO ANNE, – passed away in Hemet, CA in November 2005 of congestive heart failure. She was a secretary in Systems Integration at Downey on the Apollo program.

CARAWAY, CARL R., 73 – died in Fresno, CA on December 12, 2005 from undisclosed causes. He had served 45 years in the NAA/RI/Boeing Defense Systems area. His wife of 50 years Dee preceded him in death four months earlier.

COLE, IRENE, 75 – passed away on March 30, 2005 in Lawrenceburg, IN. Irene retired from the Contracts Department at Space Division in 1986. She is survived by her husband, James.

COPELAND, EDGAR J. "ED", 89 – passed away on December 2, 2005 in West Covina, CA of heart failure. Ed was an engineer from 1944 to 1986, mostly in environmental systems design of aircraft from the P-51 fighter through the B-1 bomber. He also served for ten years on the Apollo program.

DANKMYER, JOHN O., 86 – died of stroke complications on October 31, 2005 in Placentia, CA. He served for many years in the Logistics and Engineering areas at the Autonetics Division. No further information available.

DEAN, ROBERT, 89 – of Venice, CA died of natural causes on January 2, 2006. Bob was an aircraft mechanic with 33 years of service when he retired from the Sabreliner Division in 1981.

DENNARD JR., REUBEN G., 82 – died September 23, 2005 in Cripple Creek, CO from undisclosed causes. He worked in Apollo Flight Test for many years. His wife, Dr. Helen E. Garrett Dennard preceded him in death.

DONALDSON, ROBERT T., M.D., 79 – died in Redondo Beach, CA on December 17, 2005. Robert was the NAA flight surgeon at LAD from 1964 to 1966 and subsequently moved up to corporate until 1969. His wife Mary survives him.

DOWNING, ROBERT, 87 – died in his home in Rossmoor, CA on December 16, 2005. Bob, an electrical engineer, joined NAA in 1952 and retired in 1983. An accomplished pilot, he is survived by his wife of 61 years, Helen.

FRITZ, WILBUR F., 94 – passed away on November 14, 2005 in Laguna Beach, CA. He lived to fly. He started flying in 1932 and was licensed at Mines Field, now LAX. He was the first pilot to land at the Catalina Airport, while it was still being graded. He was an aircraft designer at Vultee, North American Aviation, Rockwell and Hughes.

HAIGH, WARREN "RAY", 78 – died of cancer on January 19, 2006. He was a retired NAA/RI/Boeing engineer. His wife of 57 years, Marguerite, survives him.

HAMMERSCHLAG, FRED J., 85 – passed away at Inland Valley Regional Medical Center from undisclosed causes. He worked for NAA/RI and other companies in the engineering disciplines for 44 years. His loving wife of 53 years, Anita, survives him.

HANSON, HARLOW F., 86 – died on January 27, 2006 in Sun City, CA. Harlow was a graphic artist at Rockwell International.

HIRAHARA, FRANK, 79 – passed away on February 7, 2006 in Anaheim, CA of unspecified causes. He joined NAA in 1954 and was assigned to the Navaho Program, the Hound Dog, and later to the Apollo Space Program in Systems Integration. After Apollo he was assigned to the Space Shuttle Integration team. Prior to retirement he was responsible for all ground operations for the Star Wars Project. He received several NASA and company awards for his outstanding contributions. His wife Mary survives him.

HARRIS, HARRY, 89 – passed away from complications of Parkinson's disease. Harry started at LAD in 1940 and transferred to Kansas City with the B-25 program. He returned to LAD to manage the Production Development Laboratory and retired in 1969 as Director of Quality and Reliability Assurance with 29 years of service.

HODGES, PRICE S., 75 – died in the early morning hours of December 26, 2005 of unspecified causes. After receiving his engineering degree he was hired by the Autonetics Division. Price particularly enjoyed the aspects of flight-testing radar systems. He retired after 30 years of dedicated service. His wife Barbara survived him.

JOHNSON, JOYCE F. "JUDY", 79 – died at home in Westminster, CA of cancer on November 17, 2005. Judy came to LAD in 1945 as a steno in Engineering Planning. After 27 years of service, she retired as Manager of Personnel & Administrative Services in Corporate in 1972. She is survived by her loving husband of 47 years, Mike, also an NAA/RI retiree.

KOWALSKI, HELEN A., 77 – passed away on February 6, 2006 in Orange, CA from unspecified causes. Her family escaped from the Soviet terror in Lithuania in 1942. Helen proudly became an U.S. citizen in 1952. She worked at NAA/RI as an Electronic Lab Technician where she achieved many numerous awards and citations for innovative solutions and high quality products. She retired after 25 years of service.

KRUMMEL, CLYDE H., 84 – died quietly of natural causes at the home of his son in Tulsa, OK. He worked as a metallurgist in the production development laboratories at the LA Division, Rocketdyne and the Neosho facility before retiring in 1969.

LEICH, HARVEY A., 89 – of Santa Maria, CA passed away on February 3, 2006. Harvey retired from the Columbus Division in 1972 as an engineering manager after 18 years of service. His wife Penny survives him.

LONGORIA, DAVID M., 75 – died December 30, 2005 of heart disease. He had worked at NAA/RI as an electrical engineer. His wife Mary survives him.

McKINNEY, CHERYL, – died on January 25, 2006 in Torrance, CA of unspecified causes. She worked as a buyer in Material for the B-1/LA Division. No further information provided.

MEDINA, RUDOLPH G. "RUDY", 74 – passed away on September 27, 2005 following corrective surgery in San Marcos, CA. Rudy was an instrumentation engineer on the FJ-3,T2J and the A3J/RA-5C at Columbus before transferring to the Paraglider and Apollo projects at Space Division. He retired in 1987 after 34 years of service. His devoted wife Dorothy survives him.

MEISTER, AMBROSE W., 84 – died December 23, 2005 from complications of a recent stroke. He began his career with NAA/RI in the 50s in the area of Protective Services. His strong work ethic was evidenced by a 31 year span during which he was never late, and until his heart attack in 1983 never missed a day.

MILLIGAN, HARRY I., 84 – died November 3, 2005 of complications resulting from a heart attack. He worked at NAA/RI Autonetics as a radio-communications engineer on several programs before retiring. His loving wife Marie survives him.

MOCIUN, TED, 86 – of Grass Valley, CA, died November 28, 2005 after a short but fierce battle with cancer. Ted retired in 1975 from Space Division after 39 years of service. His first assignment was to redraw a full size wing plan of the P-51. He played the accordion and loved to dance. He was a member of the NAA Flying Horsemen equestrian drill team.

ODOM, ROBERT G., 85 – passed away in Thousand Oaks, CA on November 17, 2005 after a five year battle with emphysema. He retired as the Division Director of Material from Rocketdyne in 1983 after 29 years of service. Bob was a decorated Marine pilot during WWII and the Korean War. His caring wife Mildred survives him.

OTSUKA, ALDEN, – died unexpectedly on December 2, 2005 from undisclosed causes. Alden joined NAA/RI in the early 80s and worked as a Reliability Engineer on the Peacekeeper, Rail Garrison and Small ICBM programs. Most recently, he was the lead engineer for the mass properties area in addition to providing expertise in some mechanical and electrical design work. His wife Leslie survives him.

PARKER, BOBBY D., 73 – passed away on November 22, 2005 in Wenatchee, WA of unspecified causes. He began his career with NAA at the Space Division in 1963. He held many responsible positions on the Apollo Space Project and was transferred to Johnson Space Center in Houston,TX in 1987. He retired in 1995. His wife of 48 years, Delores "Dee", survives him.

POHLMAN, CATHERINE M., 86 – died on January 13, 2006 from unspecified causes. She worked as a secretary for NAA/RI before she retired in 1984.

RATHBUN, LAHOMA, 74 – died on December 26, 2005 of septic shock. She had lived in Fullerton, CA prior to her passing. She served many levels of management in Finance and Marketing during her career and retired as Director of Finance/Marketing. It is sadly noted that Lahoma's husband, Norman, succumbed to pneumonia just four days after her death.

RIEDE, LEO R., 88 – of Gardena, CA, died on October 23, 2005. Leo retired from LAD as a technical artist in 1977 after 27 years of service. His caring wife Lillian survives him.

ROHRER, ALVIN, 76 – passed away on January 26, 2006 from undisclosed causes at his home with family at his bedside. Alvin spent his entire career with Rocketdyne as a machinist and a tooling engineer. His loving wife of 50 years, Luanne, survives him.

SCHNEIDERS, CHARLES H. "CHUCK", 89 – passed away in Hemet, CA on October 20, 2005 from complications after cancer surgery. Chuck was in manufacturing management at LAD and Autonetics. He is survived by his loving wife, Maxine.

SCHONAU, RALPH L., 78 – passed away in Orange, CA of Parkinson's disease on November 18, 2005. He served at Autonetics as a quality engineer for 25 years when he retired in 1991. His loving wife Virginia survives him.

SILCOCK, ALAN W., 69 – died January 19, 2006 after a gallant fight against cancer. He was at home with his family and passed peacefully. He was a stalwart in the Human Resources area and served as a department director prior to his retirement in 1996 after 34 years of dedicated service. His wife Sharon survives him.

STEVENSON, JOHN H., 89 – died December 27, 2005 in San Diego, CA from unspecified causes. He had been employed by NAA/RI for many years. No further career data available.

WARD, EWAN E. "ED", 82 – died suddenly while walking with his wife, Donna, in Apple Valley, CA on January 11, 2006. Paramedics could not revive him. Ed joined NAA/RI as an engineer in 1951. He held many responsible positions in Flight Control, Armament Control, Strike Avionics, Missile G&C and Space Shuttle. He retired in 1985.

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Photo from the Hal Emigh Collection

In December 1964, the Paraglider flight testing contracted for a CH-3 helicopter from Sikorsky to continue Tow Test Vehicle (TTV) testing. The NAA management and engineering team remaining on the program included the following members at Edwards AFB:
Back Row (standing, left to right) Tom Tate, Chuck Faulders, Howard Peregrine, EP "Hetz" Hetzel, Myron Jackson, Bert Witte, Two Sikorsky Pilots, Bob Snodgrass, Norm Christensen and George Jeffs.
Front Row (kneeling, left to right) Unknown, Rudy Medina, Hal Emigh, Ash Tischler and Douglas Marshall.

A Bald Eagles Inc. Publication

North American Aviation Retirees Bulletin

Summer 2006

Inside: **REMINISCENSES – THE EARLY DAYS** by John Young
THE NORTH AMERICAN AVIATION O-47 by Norm Avery
THE APOLLO DOCKING SYSTEM by Kenneth Bloom



Photo from the NAA Retirees Bulletin Historical Files

Although not even considered in an RFP tendered to Seversky and Curtiss for a basic trainer in 1934, North American Aviation responded with a tired looking Berliner-Joyce Navy OJ-2 trainer painted in Army Air Corps colors. The Seversky BT-8 won the design competition and Seversky received an order for thirty airplanes. Undeterred, "Dutch" Kindelberger went to Wright Field and offered to design and build a superior airplane in ninety days for a follow-on contract. The NA-16, open cockpits and fixed landing gear, was built in nine weeks and flown to Wright Field. The Air Corps requested a closed canopy and landing gear fairings which resulted in an order for forty-two BT-9s followed by an additional forty BT-9As.

NORTH AMERICAN AVIATION
Retirees Bulletin

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DEAR NAA RETIREE BULLETIN SUBSCRIBER

We begin this commentary with sadness over the passing of several of our professional friends and coworkers that we have worked with or shared some good times together. Perhaps best known, after Ralph Rudd, was Morgan "Mac" Blair. I met him after we retired but his name kept coming up for years before we met. I joked with him that it seemed like almost everyone at North American Aviation was either hired, helped or worked for "Mac" Blair, regardless of timeframe, program or division. In the final moments of preparing this copy, we learned of the tragic loss of Scottie Crossfield and the passing of test pilot Al White. This indeed is a sad edition!

In this issue, we proudly bring back two episodes from our beginnings! These are stories of pocket-poor, imagination-rich practical dreamers, led by "Dutch" Kindelberger, who created an entire industry where there was nothing but an empty field. In their own way they define who we were and who we are!

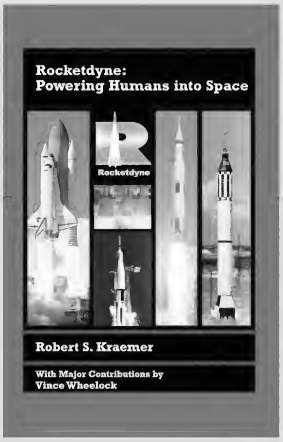
On our cover, we feature the NA-16 basic trainer. It started when "Dutch" requested $36,000 from Board Chairman Ernie Breech to build a low wing monoplane trainer to enter into an Army Air Corps competition to be held in three months. The money was granted and the NA-16 was built in nine weeks by sheer energy and ingenuity. To circumvent the NRA's 40-hour work week law, the men would come in and work at night after a respite of invigoration at an off-site beer garden. When "Dutch" chanced upon this unlawful night time activity he told them there would be no overtime pay. "Do you want to get me thrown in jail?" The workers responded, "We're not working, Dutch. We're enjoying ourselves. Is there any law against that?" The airplane was completed on time and on April 22, 1935 flown to Wright Field for the demonstration. With a team like that, how could you possibly lose?

Several months ago we were looking through our files and found a copy of a talk given by Corporate Vice-President John Young in August 1965 about the early days when he started at Fokker Aircraft and ended up working for North American Aviation. We liked the accounting and we thought you would too, so here it is in this issue. We also received a great story from our resident historian, Norm Avery, about the O-47 observation airplane. His story takes up where John's ended so now you have a comprehensive telling of our beginnings!

Moving on to the space age, Ken Bloom provides us an interesting insight on the Apollo Docking System. This system had to bring two separate vehicles together in Space! Not the easiest assignment in the best of times, but in this instance, it was very creatively designed, built, tested and accomplished by the North American Aviation engineers.

Book Review

ROCKETDYNE: POWERING HUMANS INTO SPACE
by Robert S. Kraemer, assisted by Vince Wheelock



A detailed summary of all the activities associated with Rocketdyne from the initial firing tests in the LAD parking lot to Downey and, finally, to Canoga Park and Santa Susana. Printed by the AIAA, the book provides detailed information on all of the programs, projects and, perhaps of most interest, the dynamic personalities that defined the entire division and its effect on this Nation's Space Program. The book may be purchased at Amazon.com or through the AIAA for $39.95 + $4.95 shipping. Send your check to:

American Institute of Aeronautics and Astronautics
1801 Alexander Bell Dr. Suite 500
Reston, VA 20191-4344

NAA/ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Frank Zelinski at (562) 866-3195.

The Antelope Valley Retirees Club meets in the South Meeting Room of the Palmdale Culture Center at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell/Boeing retirees are welcome.

Valley Aerospace Retirees Club meets on the 3rd Thursday of each month at the Pratt & Whitney Rocketdyne Fitness Center at 8500 Fallbrook Avenue, Canoga Park, CA. The president is Dennis Larson at (818) 340-6031.

Boeing Retirees Breakfast Club meets on the 1st Wednesday of each month at 8:00 AM for breakfast at IHOP Restaurant, corner Fallbrook and Vanowen in West Hills. Contact Howard Seese at (818) 344-7861.

"The Old LAD Stress Group" meets for breakfast approximately every two months at Mimi's Café in Torrance, CA. If you are from the old LAD Stress Group contact Gene Laxton at (310) 378-3113 or Ed Rosenthal at (310) 375-8933.

"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meet at 11:30 AM on the 2nd Wednesday of the month for lunch at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd and Mariposa Ave.

The NAA 101 Tooling Retirees Group meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at Billy's Restaurant, 5160 190th St., west of Anza Avenue in Torrance, CA.

GPS Breakfast Club meets from 7:00 AM to 8:00 AM every Wednesday at the Primrose Restaurant, corner Seal Beach Blvd. and Westminster Blvd. All are welcome. For more information, call Fred Shitara at (714) 750-1016.

Seal Beach Retirees Group meets at 11:30 AM on the 3rd Wednesday of the month at "The Fish Co." on Los Alamitos Blvd. at Katella Avenue. For more information call Marvin Blaski at (714) 848-5717 or e-mail to *mblaski@aol.com*.

The Facilities, Industrial Engineering and Plant Services Retirees Group meets at 11:45 AM on the 2nd Thursday of each month at Buster's (formerly Jolly Roger's) Restaurant in the Long Beach Marina. Contact Joe W. Mausser at (562) 596-5845.

"Ye Olde Pharts Breakfast Club" meets at 10:00 AM on the 4th Thursday of each month for breakfast at Polly's Pies at 2025 N. Tustin Avenue in Orange. For information call Frank Luis at (714) 639-0990.

The North American Rockwell Retiree Club of McAlester, OK (a satellite of Tulsa, OK) meets at 10:30 AM on the 3rd Tuesday in March, June, September, and December at the Down Town Meeting Place. Call J.A. Darden at (918) 423-0706 for more information.

Tulsa & McAlester Retirees meet for breakfast at 8:00 AM on the 2nd Monday in March, June, September and December at the Ramada Inn, 8181 East Skelly Drive in Tulsa, OK. Call Harry Phillips at (918) 838-3716.

The North American Rockwell Retirees Group of Columbus, OH Engineers and professionals meet at 11:30 AM on the 3rd Thursday of each month at the Berwick Park House. Contact Byron C. Solomides at (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH meets at Noon on the 1st Monday of the month at the Whitehall Community Park on North Hamilton Road in Whitehall. Contact E. Hamilton at (740) 927-5940 for information.

Autonetics Group including Marine Systems, Program Office, Project Office, System Test, Engineers and Designers meets for lunch on the last Wednesday of each month at the HomeTown Buffet, Rose Avenue and Alta Vista Drive in Placentia, CA. Call Mike Vohs at (714) 762-1925 for more details.

Autonetics Industrial Engineering and Maintenance Retirees meet for lunch on the 1st Thursday of each month at the HomeTown Buffet, 390 McKinley, located in front of the Home Depot, in Corona, CA. For more details, call Don Burk at (909) 698-0072.

Autonetics Retirees meet for lunch at 11:45 AM on the 2nd Wednesday of every month at the Rembrandt Restaurant or Yorba Linda Country Club. All Autonetics retirees, spouses and friends are invited. Contact Robert Nease at (714) 516-1844 or e-mail to *rfnease@email.msn.com* or Ed Venanzi at (714) 779-5652 or e-mail to *Ed-Linda Venanzi@adelphia.net*.

A Group of NAA Retirees meets for breakfast at 8:15 AM on the 1st Wednesday of each month at Knott's Berry Farm-Chicken Restaurant. All are cordially invited. Contact Maxine Haun at *maxi3131@sbcglobal.net*.

Autonetics Financial Luncheon Group meets for lunch at Noon on the last Wednesday of the month at Marie Callendars, 126 East Yorba Linda Boulevard in Placentia. Contact Ken Cantwell at (714) 970-7171 or e-mail *Kcantwell@adelphia.net*.

A Group of Engineering Management meets at 11:30 AM on the 3rd Tuesday of the month for lunch at Denny's on Imperial Highway and the 57 Freeway in Brea. Call Earl England at (714) 528-0614 for information.

NAA Tech Reps Assn. (TRA) Breakfast Club meets at 9:00 AM on the 1st Tuesday of each month at the Carlsbad Airport Restaurant. For more information, call El Presidente Rafael Colunga at (760) 940-0525.

Material Group retirees from Downey and Seal Beach meet at 11:30 AM on the 4th Wednesday of every month at the Stox Restaurant at Imperial Hwy. and Bellflower Blvd. in Downey. Contact Marian Nielson at (562) 429-1020 or Joan Dominguez at (562) 865-7200 or e-mail to *tatedom@aol.com* for information.

Rockwell Vandenberg AFB Retirees Breakfast Club meets at 8:45 AM on the 2nd Tuesday of each month at the Bakers Square Restaurant at 1641 S. Broadway in Santa Maria. Contact Marv Bailey at (805) 929-6552, Al Finlay at (805) 937-3690 or Bob Broggie at (805) 937-4674. All NAA/Rockwell/Boeing retirees are most welcome.

KSC Rockwell KMA Club meets on the 2nd Thursday of each month for lunch at the Florida Seafood Restaurant in Cocoa Beach. Contact Jerry Pruitt at (321) 636-9417 for details.

The Hangar Gang meets at the Proud Bird approximately every 4 months. For time, date and other details, call Gene Salvay at (818) 788-3974 or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

ANNUAL EVENT

Flight Test Instrumentation Annual Reunion meets annually at the Fullerton Elks Club. For information, call Frank Vigil at (562) 691-0236.

Tech Rep Association Picnic – A group of retired Field Service Technical Representatives has a yearly picnic in June at a park in Fallbrook, CA. For more information, call TRA President Rafael Colunga at (760) 940-0525 or e-mail to *rafael2@peoplepc.com*.

The Annual M&P, P.D.L., "Friends Christmas Luncheon" – This group of retirees and employees have assembled in mid-December for a festive luncheon and gabfest for the past 20 years. Those wishing to participate and receive notice of the next December luncheon, call Fred Koeller at (310) 545-8854.

Grants Pass NAA/RI Retirees Picnic Reunion will be held on Wednesday, September 6, 2006 at Indian Mary Park. Contact Bob Morse for details at (541) 474-1438 or e-mail to *lindabob2@earthlink.net*.

NAA Flying Horsemen 22nd Annual Reunion will be held on September 28-30, 2006 at Harry Shapiro's home in Yorba Linda, CA. For details call (714) 993-3496 or e-mail to *shapsplace@aol.com*.

Reminiscenses – The Early Days

by John W. Young

In August 1965, three distinguished members of the North American Aviation "family" gave an informal presentation to the Senior Engineers of the Los Angeles Division. One of them was John Young, the Corporate Vice-President of Quality and Logistics. Fortunately, his words were documented by the North American Rockwell Management Association and are in essence presented here with minor editing to reflect changes in our current status. John Young passed away in 1995 but his words still define who we were and who we are.

In 1928, North American Aviation, Inc. was incorporated as a company with a very broad charter. This charter had the right to acquire and hold stocks and securities of other companies, to manufacture all kinds of aircraft, to operate directly as an agent of air navigation facilities and to carry air mail for the United States and foreign governments.

During the first six years of its incorporation, its sole income was derived from the buying and selling of stocks and the dividends from the stocks owned. The company held substantial holdings in TWA and Western Airlines. In 1933, it acquired a 40 percent interest in the Fokker Aircraft Company, a major position in Berliner-Joyce Company and substantial holdings in Curtiss Wright and Douglas. It also owned Sperry Gyroscope and Ford Instruments outright.

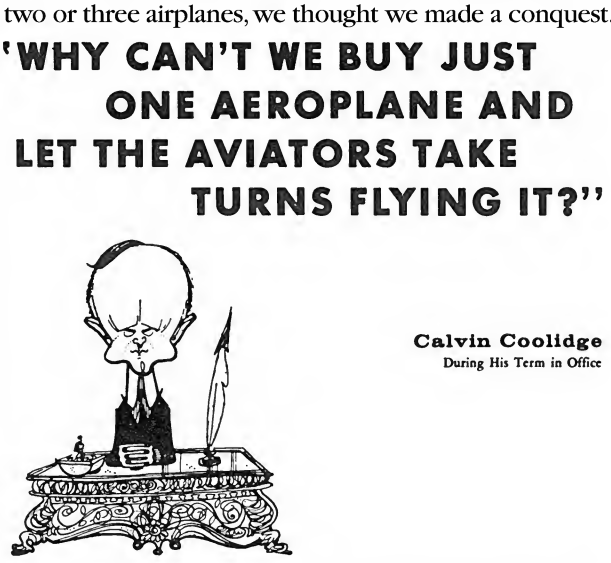
The four elements that served as the foundation for our present company were Eastern Airlines, Fokker Aircraft Company, Berliner-Joyce and the North American Aviation Holding Company. Names were changed and companies were accumulated along the way. Fokker was one of them.

Tony Fokker came to this country in the early 1920s and formed the Atlantic Aircraft Corporation. Later, it became the Fokker Aircraft Company, which between 1926 and 1929 became the largest airplane manufacturer in this country. It also gave me my first paycheck in 1929.

The company had about 900 people working at facilities in Hasbrouk Heights and Passaic in New Jersey and at Wheeling in West Virginia. My first job with the company was at the Passaic plant, which was called the Research Department. The main research we did, as far as I could determine, was to paint some fabric panels and put them on the roof to see how the paint withstood the weather.

At any rate, in 1929, General Motors decided to get into the aviation industry. Since Fokker was the largest aircraft company, General Motors bought about a 40 percent interest in the company and set up two corporations: the General Aviation Corporation and the General Aviation Manufacturing Corporation. They still retained the Fokker name because, at the time, it was a very popular name and the company was building a lot of airplanes. However, in 1930, Fokker received some adverse publicity with the death of Notre Dame's famous coach, Knute Rockne, in a plane crash. At that time, the name was changed to General Aviation Manufacturing Company.

In 1933, the General Aviation Manufacturing Company and the Berliner-Joyce Company, which had been operating as a separate company, merged. It involved a total of 600 people. During this period of time, from 1929 to 1934, the country was in the midst of the Depression and it was difficult to get contracts. A quote by a famous man may seem humorous now but back in the 1930s it wasn't very funny because anytime we got a contract for more than two or three airplanes, we thought we made a conquest.



Each year we had a new management and a new chief engineer. In 1934, Ernie Breech, who was Chairman of the Board of Directors, thought he would try again and went to Douglas and hired Mr. Kindelberger, Mr. Atwood and Mr. Smithson and brought them to Baltimore. We thought that this was just another management group coming in for another year, but they really turned the corner and from then on the company became a real success.

When Mr. Kindelberger came to the company, it had a net worth of about $11,000. The total number of people in the company numbered about 200. At just about this time, federal regulations disqualified holding companies from receiving air mail contracts. It was then decided to change NAA from a holding company to an operating company and to change the name General Aviation Manufacturing Company to North American Aviation, Inc. On the strength of the two Army Air Corps contracts which we won in Baltimore for the two place trainer and the three-place observation airplane, Mr. Kindelberger convinced General Motors that we should move to California. In November 1935, we came here with about eighty people.

We came to California as two divisions: the North American Aviation Division and the Eastern Airlines Division. In 1938 the government decided not to issue military contracts to companies that carried air mail. So General Motors had to make a major decision. Stay in the airline business or manufacture airplanes. In view of the world situation at the time, the decision was made to stay in the manufacturing business and to sell Eastern Airlines to a group of New York people headed by Eddie Rickenbacker.

From that point on, North American Aviation, Inc. was solely in the business of manufacturing airplanes. In 1948, after World War II, General Motors sold its stock in NAA to the public and we became a self-sufficient company with no other company or individual owning a controlling or significant block of our stock.

Now, I would like to present some of the early airplanes which we developed at the Fokker facilities. My first job at Fokker involved the XFA-1 at the Passaic, New Jersey facility. Only one was built, Aircraft No. A8732, powered by a 450 hp P&W R-1340C engine. It was an experimental shipboard fighter with a gull top wing and faired gear struts. It was an interesting airplane.

On top of the wing there was to be a hook. The purpose of the hook was to connect with a trapeze suspended from the dirigible USS Shenandoah and then be pulled up through an opening into a hangar compartment aboard the airship. The concept was for the airplane to protect the dirigible from attack. Another interesting feature on this airplane was the Townend engine cowl, named after the Englishman that originated it. The Townend cowl had an airfoil section and its lift gave a small forward force. It also helped to cool the engine.



Photo Courtesy of the Boeing History Archives Office

The Fokker XFA-1 U.S. Navy shipboard fighter with the Townend cowl and gull top wing. Experiments with the airplane continued until late 1932 under the new management of the General Aviation organization. Although never placed in production, the single airplane gained much valuable experience in the manufacture of all metal aircraft.

In some later airplanes this cowling was lengthened and the fuselage was bulged out behind the engine which led to the NACA cowl. In that period of aircraft design, there was not very much information available to work with. As a matter of fact, the only information that I could find to design an oil cooler came from the Royal Aeronautical Society Handbook. The oil cooler was located in the wing fuselage fillet. Either my calculations were poor, or the engine manufacturer's figures were incorrect. It didn't cool very well!

Another interesting airplane was the Fokker FC2-A built in 1928. The top speed was 112 mph. You will notice the engines do not have the Townend cowlings. This type of cowling came into use about 1930. Observe that the wing is cantilevered over the fuselage. This was a feature which Fokker developed and which was widely copied at the time.



Photo from the NAARB Historic File

The FC-2A in 1928 was the long wing version of the Fokker FC-2. Eight were constructed including the "Question Mark" flown by Major Carl Spaatz and Major Ira Eaker to set a new endurance record in January 1929 of 150 hours over Los Angeles.

The Fokker XO-27 was powered by two Curtiss-Wright Conqueror engines, each providing 625 hp. This was one of the first airplanes in which the engines were faired into the wing. It had a top speed of 160 mph.



Photo from the NAARB Historic File

The Fokker XO-27 observation monoplane constructed for the U.S. Army in 1929 presented a number of very unusual features, including the placement of the engines almost entirely within the wings. A bombardment version, the Fokker B-8, was proposed but never built.

Here is a view inside the factory building at Dundalk, Maryland in 1931. Three of the production XO-27 airplanes, designated as the YO-27, are on the assembly line. We built twelve of these airplanes for the Army Air Corps. It was quite an attractive airplane in those days. There on the left is a Fokker Universal.



Photo from the NAARB Historic File

The production model YO-27 featured several improvements over the XO-27 including geared motors, a cockpit canopy and a redesigned tail group.

The last airplane Fokker designed and built in this country was the F-32. It carried 32 passengers in daytime and had 16 berths for night flights. The major problem was cooling the aft engines. The company sold about ten of these but, in 1931, the airplane was finally discarded.



Photo from NAARB Historic File

A giant in its day, the 32 passenger Fokker F-32 was a forerunner of the four-engined transports to come. Powered by Pratt and Whitney Hornet engines of 525 hp each, the four engines were mounted in tandem pairs suspended from the wing. The F-32 had a wingspan of 99' and overall length of 70'-2".

When the company bought the American Airplane and Engine Corporation, it acquired the Pilgrim GA-43 airplane. It was a 10-place airplane with fixed landing gear, one engine and one pilot. It did approximately 170 mph, a fairly high performance airplane. Further development provided the Pilgrim GA-43 with a retractable landing gear. However, the Department of Commerce decided that transport airplanes would not be allowed with single engines. It was finally discarded after we built five of them.



Photo courtesy of the Boeing History Archives Office

The Pilgrim GA-43 with retractable landing gear capable of carrying ten passengers and one pilot, originally designed by the American Airplane and Engine Corporation became a project at General Aviation Manufacturing Company.

This essentially covers the early history of the company and some of the airplanes that were built during that period.

FLYING HORSEMEN 21st ANNUAL REUNION



The 21st annual reunion of the North American Flying Horsemen was held on September 9-11, 2005 at the home of Bob and Linda Morse in Grants Pass, Oregon. The group contributes to the Adopt-a-Rider program to help the handicapped located at the Hope Ranch Facility in Medford, Oregon. Among those in attendance were (standing left to right) Harry Shapiro, Bill Monzon, La Vonne and Fred McQuikin†, Dianne and Marlin Albert, Stan Mellin, Tim and Audrey Corkery; (kneeling left to right) Ted Mocium†, Jim Walsh, Linda and Bob Morse. †Ted and Fred passed away since the event.

The North American Aviation O-47

by Norm Avery

Any account of the O-47, however brief, requires an overview of the economic conditions and the corporate structure of the times. The design work on the GA-15, later redesignated as the O-47 was begun early in 1935 by the General Aviation Manufacturing Corporation at Dundalk, Maryland. GAMC was the outgrowth of the east coast operations of the Amsterdam based Fokker Company in which General Motors held controlling interest. In 1932, GM consolidated all aircraft manufacturing into the Curtiss Caproni plant of World War I, also located in Dundalk, Maryland.

In 1933, North American Aviation Inc. incorporated in 1928 as a holding company of aircraft securities, acquired GAMC and nearby Berliner-Joyce Aircraft Company and moved all manufacturing operations to the B/J plant. About 200 employees were on the payroll including many of German descent from the original Fokker Company. In engaging in the design and manufacture of airplanes, North American Aviation changed from a holding company to an active manufacturing concern.

These were Depression years and times were tough. Except for completion of some contracts remaining from the antecedent firms, the newly reorganized company was going nowhere. The Board Chairman, Ernest Breech, an outstanding former executive with General Motors, realized he needed some top talent if NAA was to succeed in the aircraft business. In 1934, he persuaded J. H. "Dutch" Kindelberger to leave a secure position as chief engineer of the Douglas Aircraft Company and to take over the struggling operation at Dundalk. He also hired Lee Atwood and Stan Smithson. On July 13, 1934, Kindelberger was elected as president and general manager of NAA. *(Editor's Note: The NAA Board of Directors authorized an annual salary for Kindelberger of $17,000, Atwood $6,000 and Smithson $5,000.)*

Before his arrival, the former GAMC engineers were well along with the design and fabrication of the GA-15 observation airplane. The undertaking was considered a high-risk enterprise since the USAAC expressed little interest in this type of aircraft, primarily because of funding priorities. Kindelberger, however, recognized the need to replace the aging biplanes, the Douglas O-43 and O-46, with an aircraft specifically designed for an observer.

On his recommendation, Breech convinced the directors to put up $125,000 for this project, later reduced to $105,000. Considering the times and circumstances, this was a big gamble! Design engineer Bob Sheldon, previously assigned to the GA-43 single engine transport, was appointed project engineer for this formalized project.

The resulting configuration was a large mid-wing monoplane with retractable landing gear, hydraulically operated flaps and a Hamilton Standard Hydromatic propeller. A long "greenhouse" canopy covered the cockpit which housed three crewmen in tandem: the pilot, co-pilot/radio operator/observer directly behind the pilot, and gunner in the aft position. Armament consisted of two wing-mounted .30 caliber machine guns and the gunner with a single flexible .30 caliber Browning machine gun. The observer was equipped with a double deck seat that could be lowered into a deep fuselage "underbelly" which contained windows and adequate space for camera equipment. This feature, however functional, created an ungainly "Pregnant Guppy" appearance. The wing span was 46'-3.6", length was 33'-3" and the gross weight was 7,593 pounds. The airplane was powered by an 800-horsepower Wright R-1820G-11 engine with a constant speed propeller.

Construction began in the summer of 1934 and the airplane was rolled out in July 1935. The color scheme of blue fuselage, chrome yellow wings and tail and red and white rudder stripes was standard for observation aircraft of the period. Later that month, Eddie Allen flew the new airplane, which was assigned the civil aircraft registration number X-2079.



Photo from the Norm Avery Collection

The XO-47 just completed at the Dundalk factory and still owned by NAA carried the civil registry X-2079. Under the right wing is a Douglas observation biplane which was replaced by the O-47. Photo circa June 21, 1935

Performance closely matched the results of calculations and wind tunnel tests. In late September, the XO-47, now powered by an 850-horsepower Wright R-1820-41 engine, entered the Army competitions at Wright Field and was so successful that it received the rating "unusually favorable".

A maximum speed of 223 mph, a service ceiling of 23,200' and a range of 900 miles were achieved.

Financial success, however, proved elusive. The airplane was still owned and funded by North American Aviation and the company could only hope for a production contract. Some encouragement was received later in the year when the Army requested engineering and specifications. Then in January 1936, the Army issued a purchase contract accepting the prototype with USAAC designation XO-47.

Perhaps, of greater significance to the company's financial position at the time was an order from the USAAC for 82 basic trainers based on the NA-16 design and designated the BT-9. The quantity of 82 aircraft during the Depression was outstanding and effectively eliminated the Seversky BT-8 for any follow-on orders. On the strength of this order and the hopes for future sales of the O-47, Kindelberger instituted plans to abandon the old B/J facility in Dundalk and move to the Los Angeles area. A 20-acre site was leased at the southeast corner of Mines Field near Inglewood for a $600 annual rent.

A new factory of 158,700 square feet, designed specifically

for the production of military aircraft was begun early in 1935. In November, all operations were moved from Dundalk and about 75 employees and their families made the trek to Inglewood. It was hard for them to pick-up and move but "Dutch" persuaded them with beer and crab cakes. The XO-47 was flown to the new site for further testing. The last remaining relic of the GAMC days, a dusty GA-38 transport was sold as junk for $1,500 although the junkman later complained that the airplane was practically impregnable!



Photo from the Norm Avery Collection

After the XO-47 was purchased by the USAAC, the civil registry number was removed and Wright Field Test insignia added. This photo was taken at the north end of the NAA Inglewood plant across the RR tracks from Aviation Blvd.

Success continued to elude the O-47 for another eight months when, in August 1936, the USAAC issued a contract for 64 airplanes to be designated as the O-47A (NA-25) and powered by Wright R-1820-49 engines. Subsequent orders for 45, 7 and 48 were received also under NA-25. The most noticeable difference from the XO-47 was the higher canopy.

In February 1939, another 74 airplanes plus the equivalent of 16 more in spares were ordered as the O-47B version under NA-51. Of the 238 production airplanes, 143 were posted to the National Guard and the other 95 were assigned to USAAC and reserve units.

The initial order of 64 airplanes, though less than the order for the BT-9, represented a quantity unheard of during the tough Depression years. Kindelberger's vision of having the busiest aircraft company suddenly became all too true and manufacturing space had become critical. Space was needed for the O-47, BT-9 and the BC-1 already on the drawing boards. Plant expansion was immediately begun and factory area was increased on a continual basis to 380,000 square feet by 1938. North American Aviation had begun its rise to prominence!

It was the O-47 and the BT-9, both begun at Dundalk before the move to California that became the "bread and butter" that provided the impetus for expansion. Although the O-47 ended with 238 units, the BT-9 became the antecedent design for thousands of future trainers and export aircraft.

The first O-47A was accepted in April 1938 and the final O-47B was delivered in February 1940. During World War II, they were used for training and target towing and a few were used operationally for anti-submarine patrol off the Australian coast, the Gulf of Mexico and the Panama Canal Zone.

The O-47 was an advanced airplane for its time. Design features included all metal stressed skin construction, monocoque fuselage and full cantilever wings and tail planes, selective position hydraulically operated flaps, hydraulically operated landing gear and a high pressure hydraulic system. Another unusual item was the built-in flotation compartment. Many of the design features incorporated in the O-47 can be traced directly back to the GA-43 Pilgrim transport airplane.



Photo from the Norm Avery Collection

The O-47B number 1, AC39-65 was prepared for final delivery to the USAAC from Mines Field in February 1939. A macadam tarmac had not yet been put down, only a diagonal taxi strip to the airport runway had been completed. The open hangar at the far left was the final assembly area for the Northrop A-17. One of the old Mines Field buildings after historical preservation.

About the Author: An editor is always very blessed to have an author like Norm Avery on his team. Norm is an avid engineer, writer and historian that has graciously provided the NAAR Bulletin with multiple articles, photos and anecdotes about North American Aviation and the airplanes designed and built there.

Norm Avery joined NAA in 1944 as a draftsman in the Engineering Power Plant Group working on the B-25, P-51, AT-6, XAJ-1 and numerous other aircraft including the B-70 and the B-1. He retired in 1980 from the Energy Systems Division in Canoga Park after some 12 years of mechanical design in support of atomic energy. Norm has contributed numerous scholarly articles to the Journal of the American Aviation Historical Society and has authored two books: NORTH AMERICAN AIRCRAFT 1934-1998 VOL. I and B-25 MITCHELL, THE MAGNIFICENT MEDIUM.

Norm currently resides in Agora Hills, California.

CONGRATULATIONS and BEST WISHES to

Dale and Kathleen Mackenstadt of Florence, Oregon
celebrating their 64th Wedding Anniversary

The Apollo Docking System

By Kenneth A. Bloom

Preliminary Evaluations

In May 1962, the NASA prepared a preliminary outline for space docking between two spacecraft designated as the Command Service Module (CSM) and the Lunar Module (LM). After lengthy consideration, it was determined that the smaller vehicle, the LM, would undock in lunar orbit, descend to the moon, and return to lunar orbit and dock with the CSM. The proposed method was termed the "Apollo Docking System".

Gemini Flights which succeeded the Mercury Earth-orbital flights, had provided an opportunity to try out the various techniques of rendezvous and attempted docking that were proposed at the time. The Gemini program developed rendezvous and docking techniques essential to the Apollo. In order to accomplish the lunar landing mission planned by NASA, a method for structurally joining the CSM and the LM had to be developed that would allow internal crew transfer from one vehicle to the other. Internal transfer was desirable because of the uncertainties of space environment.

At North American Aviation (later Rockwell) we went to work on the design of the spacecraft docking system in December 1963. From the preliminary analysis and design studies, it was decided that two basic docking concepts would be evaluated further to fulfill the requirements for Apollo docking. They were an extendible tether system concept and an impact system concept.

Four extendible tether systems and one impact system (expanding probe and drogue) were designed. These were being evaluated, when NASA requested that two more systems of the impact concept design, the NASA designed Ring and Cone system and the Gemini system (as successfully used for Gemini docking missions) be included in the evaluation.

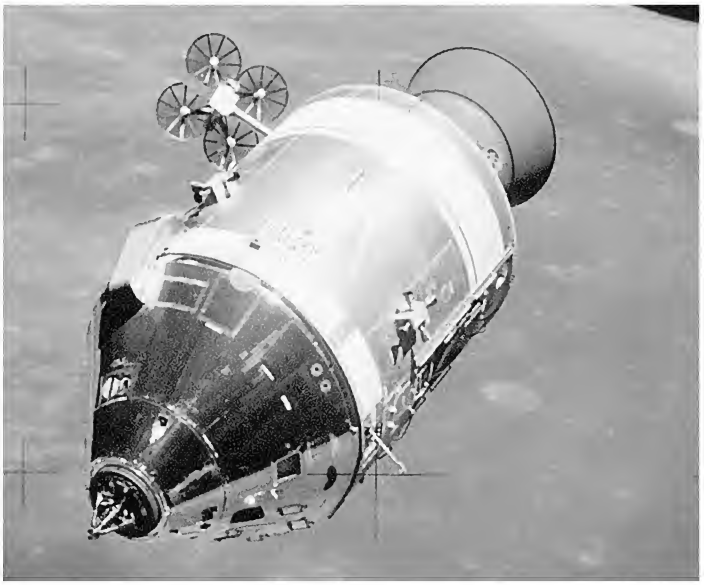
After completion of all evaluations and studies, a recommendation was made to NASA that the center probe and drogue system be used for the Apollo docking.

Mission Functional Requirements

Mission requirements dictated a system design that would (1) obtain initial vehicle coupling of the CSM to the LM, (2) attenuate vehicle impact energy and provide vehicle centering and alignment, (3) incorporate an automatic or remotely actuated retraction device to draw the vehicles together after capture, (4) supply a rigid structural connection between the vehicles during all maneuvering loads, (5) provide single-crewman removal and installation of both the probe and drogue units for tunnel clearance from either vehicle, (6) include a means of remote separation of the vehicles from the pressurized crew compartment of the CSM, (7) provide a passive coupling to the launch escape tower for automatic removal of the docking system in the event of low altitude abort, and (8) provide a redundant power and indication circuit for all electrical and pyro components.

Coupling the CSM Probe and LM Drogue

The probe head located in the CSM was self-centering and gimbal-mounted to the probe piston. As the probe head engaged in the opening of the drogue socket, 3 spring loaded latches depressed and engaged. A depressed locking trigger



NASA Photo

While circling the moon, the CSM with extended docking probe awaits return of the LM.

link at each latch allowed a spring-loaded spool to move forward, maintaining the toggle linkage in an over-center locked position. In the upper end of the LM tunnel, a truncated cone structure (drogue) of 1 inch thick aluminum honeycomb core, bonded front and back to aluminum face sheets, was the receiving end of the probe head capture latches.

In undocking, the release of capture latches was accomplished by electrically energizing tandem-mounted DC torque motors located in the center piston. In a temperature degraded condition, a single motor release operation was done manually in the LM by depressing the locking spool through an open hole in the probe heads, while release from the CSM was done by rotating a release handle at the back of the probe to rotate the motor torque shaft manually.

Shock Attenuation and Vehicle Centering

Vehicle jackknifing in pitch or yaw caused by contact of the drogue with one or two pitch arms was attenuated by direct compression of an independent attenuator and a sliding link around the probe. The linkage was duplicated radially around the probe at three places 120 degrees apart. The use of the radial linkage provided an independent dual-shock attenuation capability. Use of three individual attenuators also provided redundant dissipation of axial energy in the event of a single unit failure.

At one end of the probe center piston was a centering beam or pitch arm, and at the other end was the radially located linkage around the probe and the yoke (that was attached to the cylinder collar). The linkage expanded to mate with the drogue cone and provided vehicle centering. Compression of an air spring provided extension force in each attenuator. This stored energy aided the probe center spring in providing vehicle separation force at undocking. It also provided the automatic folding force for collapsing the probe during removal from the tunnel.

Retraction

After the initial capture and stabilization of the vehicles, a closing force of 1,000 pounds minimum was available by the probe to draw the vehicles together. This force was generated by gas pressure reacting on the center piston within the probe cylinder. Piston retraction compressed the probe and interface seals and actuated the automatic ring latches.

The pressure was generated by a dry-nitrogen pressure system located inside the probe cylinder consisting of four hermetically sealed pressure vessels, socket-mounted and sealed to a common manifold. Each pressure vessel, containing 6 cubic inches of dry nitrogen gas was pressurized to 5,000 psi and sealed by a welded metal diaphragm. Each vessel was capable of producing the 1,000-pound retraction force.

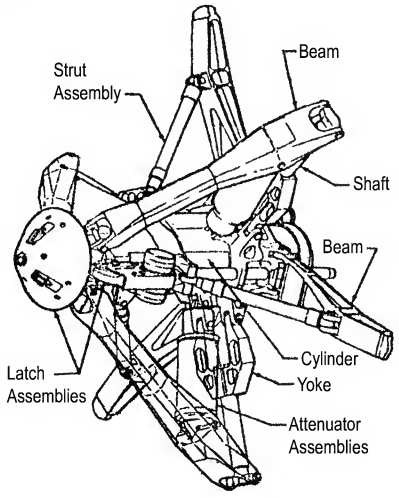
Structural Connection

Twelve automatic locking latches were located radially around the inner surface of the CSM docking ring. The latches were self-contained, stored-energy devices individually actuated by the closing motion of the two vehicles as they were drawn together. Actuation of the latch and engagement of the LM ring was fully automatic and provided rigid structural integrity between the docked vehicles. Crew operation was required only for manual disengagement of the latch prior to undocking. The manual release operation automatically reset the latches for the next docking engagement.

Probe and Drogue Removal and Installation

Provisions for intravehicular crew transfer were incorporated by the design of a foldable probe assembly. Folding and removal of the probe can be likened to the folding or collapsing of an umbrella. Folding was accomplished by release of a single lock with telescoping action. By this means, the three support beams attached to a sliding collar retract from their sockets in the tunnel and geometrically fold into a smaller diametrical package. Installation of the probe required compression of the attenuators against the air spring that induced the removal and folding.

Removal of the drogue was done by rotating a locking lever in the support mount, allowing the drogue to rotate out of its sockets. Installation was accomplished in reverse order with the aid of ramps in the tunnel to guide the drogue into the support fittings.



CSM Docking System

Separation

An automatic extension latch attached to the probe cylinder body engaged and retained the probe center piston in the retracted position. Before vehicle separation in lunar orbit, manual cocking of the twelve ring latches was accomplished. The separating force from the internal pressure in the tunnel area was then transmitted from the ring latches to the probe and drogue. To accomplish this balance of load and maintain interface sealing integrity, the probe and drogue had to be preloaded through the capture latch/drogue interface.

Launch Abort

In the event of a vehicle launch abort, the docking system must be separated from the CM to provide clearance for parachute deployment and subsequent recovery conditions. To provide this separation capability, a passive tension link was connected to the boost protective cover and to the probe head by means of shear pins located in the probe head.

Electrical System

The design of the docking system for Apollo provided a completely redundant electrical system. This included all logic and pyro functions. Event indication was displayed to the astronauts through indicators located on the main display panel representing the A and B electrical systems. In addition, the electrical system was designed to use a minimum of main display panel space with a single-toggle switch for extend/release and retract.

System Testing

In order to provide comparative operational characteristics of preliminary design concepts for the docking system, we designed and built two test vehicles. Each was supported by air bearings to simulate docking vehicles. The tests incorporated full-scale docking hardware, and we conducted the tests in an existing aircraft hangar at our facility where a specially constructed floor was built in order to obtain a perfectly level surface on which to conduct these tests. The vehicles were supported on a column of air furnished through hoses connected in the hangar. We spent many hours conducting and reviewing the air pad tests, and although the full scale hardware used on the simulators did not provide true dynamic characteristics, the relation of one system to another was evaluated with acceptable results.

In addition to the testing operation, we established independent but parallel programs to verify the dynamic and static structural and functional capabilities of the system in mission flight environments. Static structural capability was defined through use of three-dimensional math model generated loads applied in a static condition. Mission environment was also a concern with the docking hardware relative to the Apollo spacecrafts.

Another requirement was for a light compact docking system that an astronaut in zero-g would be capable of operating - the astronauts must have the capability to understand and operate the docking mechanism in this environment. In the case of the probe and drogue, the requirement was to be able to install and remove the hardware from the docking tunnel area. The original design involved the extensive use of special tools already in the astronaut tool kit. However, I spent much time in demonstrations with the astronauts; explaining the



Photo from the Kenneth Bloom Collection

Testing of the Apollo Docking System was conducted under stringent conditions: Test vehicles were supported by a column of air on a specially constructed flooring.

operation, installation, and removal of the docking system in the tunnel. Successful maneuvers of docking and undocking were done on Apollo Mission 9 and Mission 10 in rehearsal for the subsequent lunar landing Apollo 11 Mission. The Apollo 14 Mission encountered some difficulties in attempting a docking. NASA quickly mobilized a duplicate probe and drogue in Downey along with our experts on the docking system. Corrective procedures were demonstrated, transmitted to the crew and a successful docking was accomplished.

NASA established a Water Immersion Facility in addition to the existing counterbalance mockups, and scheduled a zero-g flight program using a KC-135 airplane. Use of the Water Immersion Facility established acceptable operating handle forces which were then integrated in the hardware design. The zero-g flight program provided a realistic operational environment close to that of actual flight. Astronauts, company test pilots, and we engineers participated in this program.

The Apollo In Space

Initially, because of the unknown, personnel safety was a prime consideration and all precautions were taken against contamination from outer space. Following the first lunar orbit, the probe and drogue of the docking system were sent to a Lunar Receiving Laboratory in Houston to determine if any contamination had occurred on the probe and drogue during its journey around the moon. It was here that the probe head was removed and swatches of cloth were used to wipe the surfaces of the probe, analyzing and checking for contamination. Contamination was not found so it was decided that we could continue using the probe and drogue for lunar missions. Astronauts on early space flights went through a decontamination procedure in a special Lunar Receiving Laboratory upon returning from a space flight. As Engineers and individuals in contact with materials returning from the flights in space, we were required to enter the Lunar Receiving Laboratory and wear special sterile laboratory garments covering us completely - similar to those worn in operating rooms. Upon exiting the Laboratory we entered a decontamination area for our personal safety. Later flights did not require such precautions.

There were many hurdles that had to be overcome in the lunar missions as man's confrontation with a mechanical interface in space environment required significant crew effort. Knowing this fact, within the design of the Apollo docking system we strived to combine reliable mechanism, unique design, compactness, and durability, and the system was frequently termed "the door to the lunar landing". The design of the system incorporated practically all the resources of engineering. George M. Low, as NASA Apollo Spacecraft Program Manager, described the Apollo Docking System as "designed with the precision of a Swiss watch, yet strong enough to stop a freight car".

Our ventures into space and particularly the Apollo missions have left us with many legacies: scientific development and practical applications; a step forward in comparative planetary studies; massed resource material and background for the Apollo-Soyuz missions. Significantly, we trust that the knowledge gained through the design and use of the Apollo docking system may prove beneficial to future programs of exploration of the solar system.

One Final Note

It is interesting to note that recent news media reports state that NASA has suggested possibly adopting the Docking System used on the Apollo flights for future "back to the moon missions" with subsequent trips to Mars as early as the year 2018. We will see what future plans NASA develops from this concept.

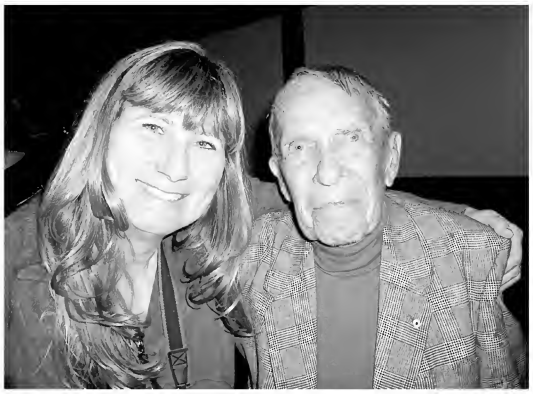
About the Author: Ken Bloom is a graduate of the University of Wisconsin at Madison with a degree in Civil Engineering. At Rockwell Space Division in 1963, Ken began work on the initial design and tests for the Apollo docking system and later became engineering supervisor responsible for the design development of the Apollo docking system. In 1971 Ken headed the design group for the Apollo-Soyuz docking system, working with NASA and interfacing with Russian engineers responsible for the Soyuz. Later positions included Payload Cradle design, Centaur Integration, and Payload/ Cargo Integration. Ken is the recipient of numerous NASA and Rockwell/Boeing awards. He resides in Torrance, CA with his wife, Ann.

44th Annual Bald Eagles Reunion

photos by Lee French



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Dale Myers, Ruby Richey, and Dr. John Peller

Contrails From The Past

by Ed Rusinek

Dear Ed,

In perusing the Fall 2005 issue of the bulletin, you stated that in 1939 each employee received a turkey as a Christmas bonus. I recall that in 1938, I received a bonus check of $36.00 which was the equivalent of two weeks pay.

I do not recall receiving a turkey in 1939. Has the time of application expired or can I put in a claim? In any case, here is my $10.00 for 2006. Congratulations to all you volunteers.

—Frank McCambridge, Sun City, CA

Ed's Ans.: Nice try, Frank! But at this late date, you don't even get a wishbone.

Dear Ed,

I thoroughly enjoy the bulletin. I am working on a book about the Apollo program and I am trying to contact retirees that worked on the Apollo. I, myself, worked at Rocketdyne on the F-1 and the ACS (Attitude Control Systems) engines. I am looking for interesting stories that may be out of the mainstream of engineering development. For example, at Rocketdyne, we solved the problem of loose parts or tools that might have been left in a J-2 engine assembly in a rather bizarre way.

The engines were fabricated in a building south of Victory Boulevard and then sent to the Shipping Department located north of Victory through an underground tunnel to avoid interference with street traffic. The floor in the tunnel was a rough concrete slab. To ease the ride, the engines were transported on dollies with special soft pneumatic tires. One day there were no dollies available so an old one with hard rubber tires was used that had been previously employed at LAD to transport P-51 engines.

It was truly a rough ride and at the end a lot of small parts could be heard jangling inside the engine assembly. Viola! A solution to loose parts became instantly obvious. All the soft pneumatic tires on the dollies were removed and replaced with hard rubber ones. If any retirees have an Apollo story of their own, I can be reached at 1-800-90-ENERGY.

—Richard "Dick" Morgan, Canoga Park, CA

Ed's Ans.: I am sure there are some great yarns rattling in the heads of our retirees. Perhaps, this would be a good time to document them in your tome, Dick.

Dear Ed,

I noticed in your front cover story, Spring 2006, that "Wheaties" Welch was killed in F-100, Airplane No. AF52-5756. I was the Electrical and Instrumentation Night Crew Chief on that plane. Welch made his last successful flight in that airplane, signed off on it, got into another F-100 and was killed. Sorry, I don't remember the aircraft number of that airplane.

—William M. Snider, Apple Valley, CA

Ed's Ans.: Thanks for the memories, Bill. You folks on the flight line always did a great job of keeping the planes flying.

Dear Ed,

I truly enjoyed Jack Bailey's article, Spring Issue 2006, about the F-100. It brought back to mind an event one pilot experienced which affected every F-100 built. In July 1954, I was assigned to Handbook Diagrams under J. G. "Pop" Trousdale. We generated the electrical schematics for the handbooks used by the techs in the field.

The event that involved the F-100 occurred at LAX when a pilot took off in his new F-100. As he retracted the landing gear, all hell broke loose! Warning lights lit up, buzzers sounded, and various other alarms went off. The pilot radioed the tower declaring an emergency and stating that he was going to eject over the ocean. The tower told him that they could not see any smoke or fire and asked him to do a flyby. He recycled the landing gear switch and everything returned to normal. He did the flyby and the tower told him he was cleared to land. He did this without any problem. The F-100 was completely checked out and nothing wrong could be found.

The pilot was requested to go into the simulator, and do exactly what he had done when he had the problem. He did, and as he became airborne, he retracted the landing gear. Again, all hell broke loose!

It turned out that he, unlike the 99.9 % of the pilots who actuated the gear by slapping the gear switch up or down, moved the switch slowly up. This resulted in the electrical contacts becoming neutral and not in contact with either side. It was described as a "break before make" situation. It resulted in a change out of all the twelve-pole landing gear switches on every F-100 in service. I was in charge of producing the schematic for the TCTO (Time Compliance Technical Order) to accomplish this change.

As I said, Jack Bailey's article brought back some memories.

—Russel D. Monroe, Orange, CA

Dear Ed,

Although I never met Mr. Bailey, I recall reading, as a young engineer in the Flight Control Group, his U.R. report about the F-100 flight problem at Foster AFB in Texas. The U.R. (Unsatisfactory Report) was a report submitted by Field Service Tech Rep describing any problem experienced with an aircraft after delivery to the Customer.

His description of the incident exhibited the literary talent of the writer. What especially remained in my memory was, "The pilot bailed out successfully, landing in a cemetery of flush type headstones, a boon for ejected pilots." Though the plane was a serious loss, his humorous details made entertaining reading.

—Peter Galovich, Rancho Palos Verdes, CA

Dear Ed,

I just wanted to tell you how much I enjoyed Jack Bailey's "Taming of the Hun" story about the F-100, partly, because that was my era with NAA. I was in Publications from 1945 to 1981, He mentioned a lot of names that brought back memories from John Casey, to Gordy Rymal and Bob Wiley. I met and married my husband Gene at NAA and we both retired in 1981.

—Mary Gaston, Los Angeles, CA

Ed's Ans.: Dang! This is only a sampling of the letters we received regarding Jack Bailey and his great article. We hope Jack will honor us with more articles in the future but he is still actively writing and has several projects in the works.

The Silent Majority

by Stan Guzy



CROSSFIELD, A. SCOTT "SCOTTIE", 84 – was killed in a plane crash on April 19, 2006 in the mountains 50 miles NW of Atlanta, Georgia. He was on a return flight from Alabama to Virginia, when his small Cessna 210A dropped off radar screens. There were thunderstorms in the area. Scott embodied what came to be called "the right stuff". He routinely climbed into some of the most powerful, most dangerous and most complex machines of his time; took them to their performance limits or beyond and brought them back to Earth in one piece. In 1942, Scott joined the Navy and became a Navy pilot. After the war, he returned to the University of Washington and earned an MS in Aeronautical Engineering. He joined the National Advisory Committee for Aeronautics at its High Speed Flight Research Station at Edwards, CA in 1950 as a research pilot. In the next five years, he flew the X-1, X-4, X-5, XF-92A, and the D-558-I and -II aircraft. He made aviation history on November 20, 1953 when he reached Mach 2 or more than 1,320 mph in the D-558-II. In 1955, he joined NAA as a consultant and test pilot on the design and construction of the X-15. Scott completed 16 captive carry flights mated to the B-52 launch aircraft, one glide and thirteen powered flights in the X-15 reaching a maximum speed of Mach 2.97 or 1,960 mph and a maximum altitude of 88,116 feet. On his fourth powered flight, one of the rocket chambers exploded, causing an engine bay fire. Scott shut down the engine and prepared for an emergency landing. He touched down at a low speed in a nose high attitude. When the nose gear slammed down, the fuselage buckled just behind the cockpit and the plane slid on its nose gear, belly and main gear skids. Scott escaped uninjured. During a ground test in an engine stand, he was seated in the cockpit of X-15 No. 3 when a malfunctioning valve caused a catastrophic explosion. He again escaped injury while the airplane had to be completely rebuilt. He later served in Downey as systems director of test and quality assurance on the Hound Dog, Paraglider, Apollo and Saturn V programs. In 1967, Scottie left NAA to seek other challenges but his bond with the X-15 and NAA will never be forgotten.



WHITE, ALVIN S. "AL", 87 – of Oro Valley, AZ passed away on April 29, 2006 after a brief illness. Al received his commission as a 2nd Lieutenant in May 1942 at Williams Field, AZ where he served as an advanced flight instructor for twin-engine aircraft. He volunteered for combat and was assigned 355th Fighter Group in England. Completing two tours with the group, he flew extensive P-51 missions including the Frantic Seven mission escorting B-17s carrying supplies to the Polish Underground fighting in Warsaw and then going on to Russia. His group returned to England via Italy, a total distance of over 5,500 miles. After the war, Al received a degree in mechanical engineering and returned to the USAF as a test pilot at Edwards AFB, flight testing the C-119G, F-80, F-86D, F-84F, F-94C, and the F-89D. In 1954, Al accepted a position as engineering test pilot with NAA/LAD. He tested every NAA airplane except the X-15 and was appointed Chief Test Pilot in 1961. His greatest recognition came when he flew the XB-70 at Mach 3. He was a founding member and past president of the Society of Experimental Test Pilots and had received every major award in his profession. Al was the epitome of a highly skilled pilot and a highly proficient engineer. Al clearly defined his life in his autobiography, *"The Times of My Life—A Pilot's Story"*. His loving wife Betty survives him.

BAISDEN, GLADYS M., 83 – passed away in Torrance, CA on March 31, 2006 of chronic obstruction pulmonary disease (COPD). Gladys retired in 1972 from LAD where she served for 26 years as a keypuncher, keypunch lead and documentation analyst. She is survived by her loving husband Clarence, also an NAA retiree.

BIRDSALL, WILLIAM S. "BILL", 80 – died on March 23, 2006 of cancer in El Segundo, CA. Bill joined LAD in 1951 as an engineer in the propulsion installation group and, subsequently, served as a project engineer for the B-70, Advanced Systems, F-15, B-1, and the Sabreliner. He retired in 1980. He had a lifetime interest in magic and was an early member of the LA Magic Castle.

BLAIR, MORGAN M. "MAC", 84 – of Lomita, CA, succumbed to cancer on April 13, 2006. "Mac" retired in 1984 after 40 years of service, which included almost all programs, locations and timeframes involving NAA/Rockwell. His span of assignment locations included LAD, Columbus, Space, Science Center and Corporate Office. He was an author and a source of much resource information for this publication. His loving wife Elizabeth survives him.

CARL, MICHEAL P., 91 – of Santa Ana, CA died on April 21,2006 from undisclosed causes. He had been an inspector at NAA/RI prior to retirement. No further information available.

CISKOWSKI, MARYAN V. "SKI", 89 – passed away in Long Beach, CA on March 4, 2006 after a lengthy battle with the effects of several strokes. "Ski" fulfilled a boyhood dream and joined the Navy in 1935. He retired as a Chief Petty Officer after 20 years of service and started a second career in Security at the Downey facility where he retired a second time after 21 years of service.

COMBA, STEWART M., 78 – died in Grants Pass, OR on April 8, 2006 of complications from pneumonia. Stewart was a Quality Control inspector at Space Division when he retired in 1987 after 40 years of service. He is survived by his loving wife of 51 years, June.

COPELAND, EDWARD J., 89 – died from undisclosed causes in December 2005. Ed lived in West Covina, CA. He had been in engineering supervision at several NAA/RI divisions prior to his retirement. No further information made available.

DENNIS, JEPTHA W. "JEP", 75 – of Warner Robins, GA died of undetermined causes on January 28, 2006. Following a 30 year USAF career, he joined Boeing as a Logistics Engineering manager at the B-1 Division and later served as a B-1 Logistics representative at Warner Robins AFB. He is survived by his loving wife of 50 years, Margaret Joan.

DEVORE MARTIN C., 94 – died on March 29, 2006 of chronic obstruction pulmonary disease (COPD). Marvin lived in Mission Viejo, CA and had been an electronic technician at NAA/RI prior to retirement.

DONALDSON, SAMUEL N., 74 – died on March 18, 2006 in Smyrna, GA. Sam earned his BS degree from Cornell University with distinction from the ROTC program. He received his MBA from Stanford University and served on active duty as a major in the U.S. Air Force. He joined Autonetics in 1966 including a two-year stint in Oxbridge, England. Sam retired from the Finance Department in 1991.

DOWNES, HAROLD J., 84 – died on February 25, 2006 in Encinitas, CA from undisclosed causes. He retired in 1984 as corporate attorney and vice president of NAA/RI. His wife of 62 years, MaryAnn, survives him.

FOSTER, DOROTHY L., 80 – died on March 1, 2006 of natural causes in Carlsbad, CA. She had retired from NAA/RI several years ago.

FRANTZ, ROBERT J., 78 – passed away on April 13, 2006 of undisclosed causes. He lived in Los Alamitos, CA and had been employed as a design engineer at NAA/RI. His wife Mary survives him.

GALLY, STEVEN V., 86 – died on February 1, 2006 in Oxnard, CA. After serving as crew chief in the Army Air Corps, he came to NAA as an electrical technician in the Engineering Flight Test unit at Edwards AFB and the Palmdale Facility. Steve served on many aircraft projects and the Space Shuttle program before retiring.

GEARY, THOMAS, 65 – died in a motor home accident near Houston, TX on December 3, 2003. Tom had worked at Space Division and

Autonetics in the area of Standards Support before retiring in 1996 after 36 years of service.

GREEN, ELIAS "BUD", 86 – passed away on July 19, 2005 in Orange, CA from undisclosed causes. Bud had been the Manager of Configuration Management at LAD, later worked at Space Division through 1968 and retired from LAD in 1978.

HANSEN, JOHN P., 81 – died on July 9, 2005 in Santa Maria, CA from complications of renal failure. John was a WWII plane crash survivor in the China-Burma-India (CBI) theater while dropping supplies to Allied forces. He served in Industrial Security for 35 years as a patrolman and retired from the El Segundo facility in 1987. John met his wife of 33 years, Marge, at LAD and is survived by her.

HARDY, WALTER V., 90 – died on March 17, 2006 of cardiopulmonary arrest and Parkinson's disease. He retired from NAA/RI. No further information available.

HIPP, PAUL E., 68 – passed away in Poway, CA on April 10, 2006. Paul retired in 1999 from NAA/RI/Boeing where he worked as a cinematographer for 26 years, earning many rewards for his film and video work. His wife of 46 years Mary survives him.

HOLLADAY, MARSHALL M., 93 – passed away on March 14, 2006 in Hemet, CA. He was a crew chief on the Trisonic Wind Tunnel for many years and received numerous awards for excellence.

HUTCHERSON, JOHN R., 78 – died on May 6, 2006 of complications from pneumonia. John was a 34-year resident of Orange County, CA prior to moving to Ft. Mojave, AZ. He retired from NAA/RI as a Plant Services Manager in 1987 after 30 years of service. His wife of 59 years Betty survives him.

KISTLER, WILLIAM H. "TINY", 86 – of Palmdale, CA, died on April 12, 2006 due to complications of heart surgery. "Tiny" retired in 1982 after 40 years of service at Space Division and at Palmdale where he worked on the XB-70, Apollo and Space Shuttle.

KLITSCHE, DONALD L., 79 – a long time resident of Silver Lakes, CA, passed away on September 29, 2004. He started his career at LAD in the Weights Group and transferred to Downey and became a supervisor in the Mass Properties Group on the Apollo program. He retired in 1981 after 36 years of service.

KNERR, ROGER M., 75 – a long time resident of Woodland Hills, CA, passed away suddenly on March 17, 2006 of undisclosed causes. He was an aerospace engineer on the Space Shuttle program prior to his retirement in 1986 after 20 years of service.

LARIMER, FRED F., 88 – passed away in Long Beach, CA of congestive heart failure on February 7, 2006. Fred retired from Space Division in 1977 after 25 years of service. His wife of 63 years, Betty, survives him.

McQUERRY, WAYNE H., 83 – of Orange, CA died on April 21, 2006 of natural causes. He had worked at LAD on the B-1A program in the Engineering Research labs prior to retirement. No further information available.

MORRIS, WALTER E., 80 – passed away on March 23, 2006 in Collinsville, OK. Walt worked in the B-1B Program Planning & Control department at LAD and Tulsa before he retired from the Tulsa Division in 1985.

NAGLE, BETTY, 85 – died on March 22, 2006 of natural causes. She lived in Mission Viejo, CA and worked as an editor for NAA/RI prior to retirement.

NARDELLI, VICTOR, 85 – of Glendora, CA passed away on March 13, 2006. Victor retired from NAA/RI after 25 years of service, including work on the Apollo and Space Shuttle projects. His wife Lucy survives him.

O'NEILL, MICHEAL S., – died on November 23, 2005 of undisclosed causes at his home in Tustin, CA. He had worked in the LAD Tooling department and Manufacturing Engineering before his retirement in 1978 after 32 years of service.

PAINE, EDGAR W. "WEB", 84 – died on May 5, 2006 of undisclosed causes. He had worked on major NAA/RI programs, including the B-1 and the Space Shuttle, as a financial planner prior to retirement.

PETERSON, LAWRENCE E. SR., 91 – died on May 8, 2006 after a short illness. After retiring from the Air Force he began a second career at NAA/RI Autonetics as a Manager of Government Property. He retired in 1988 at the age of 73 and moved to a retirement community in Anaheim Hills, CA.

RASCHICK, ALBERT W., 87 – died on April 2, 2006 from natural causes. He was a U.S. Navy retiree prior to his employment and subsequent retirement from NAA/RI, where he worked in the engineering department.

RAUSCHENBACH, FREDERICK M., 85 – a resident of Fullerton, CA died on March 10, 2006 of complications brought on by Alzheimer's disease. He was a retired aeronautical engineer for NAA/RI/Boeing. No further information available.

REETZ, WILLIAM H. "BILL", 81 – passed away in his sleep on November 17, 2005 in Whittier, CA. Bill retired from Space Division in 1988 after 26 years of service as a reliability engineer, primarily on satellites. He was an avid Lou Gehrig fan and an old movie buff who dearly loved the U.S. Marine Corps. Bill served with the 4th Marine Division at Iwo Jima. He was also our good friend. Semper Fi, Bill.

ROBERTS, ROBBIE W., 85 – passed away on April 23, 2006 after a lengthy illness. Robbie had retired from NAA/RI in the late 1980's and kept in contact with several of her co-workers over the years. No further information available.

RUBENSTEIN, SEYMOUR Z. "SY", 67 – passed away peacefully in Chandler, AZ on February 26, 2006 surrounded by his family and close friends. Sy was a huge man in stature and in accomplishment. He held every position of leadership at Downey as Director of Avionics Systems Engineering, Vice President of Engineering, Chief Engineer for Space Shuttle Development, Vice President and Program Manager, President of Rockwell Space Station Division, and President of Space Division. At the time of his death, he was working on the return to space project. He was a Fellow of the AIAA and the American Astronautical Society and had been awarded the NASA Distinguished Public Service Medal. Sheila, his loving wife of 46 years, survives him.

RYKER, NORMAN J. JR. "NORM", 79 – died May 7, 2006 at his home in Santa Clarita, CA. Norm was always highly regarded as a skillful technical leader. As Project Engineer, he led the engineering team that captured the Apollo Command and Service Modules contract. He also led the redesign of the Command Module after the Apollo I fire. The first lunar landing occurred while he was serving as Vice President of Engineering at Space Division. In 1976, Norm was appointed President of Rockwell International, participating in the successful development of the first reusable main liquid engines Space Shuttle engines at Rocketdyne. He left Rockwell in 1983 after 32 years of service to seek other aerospace challenges.

VOILES, FRED L. "FREDDIE", 77 – passed away on May 17, 2006 in Perris, CA of heart related complications. Freddie started at LAD in 1952 as a millwright mechanic. He transferred to the Torrance facilty and, later, retired as a machine shop supervisor from Space Division in 1988 after 36 years of service. He is survived by his loving wife Joan, another NAA retiree.

WELCH, WILLIAM "BILL", 80 – of Grass Valley, CA died on February 17, 2006 at Sierra Nevada Memorial Hospital. Bill served in the Finance Department at Autonetics for 20 years. His wife Lois survives him.

WHITMORE, JARVIS H., 78 – died in an accident at his home in Oceanside, CA on February 12, 2006. With a degree in aerospace engineering, he dedicated 42 years to the aerospace industry including work on the Apollo, Skylab and the Space Shuttle projects. He also worked on the initial design phases of the C-17 aircraft. He retired from NAA/RI/Boeing in 1998. His wife of 47 years, Ida, survives him.

LOST SHEEP – BULLETIN RETURNED WITH NO FORWARDING ADDRESS

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Photo from the Norm Avery Collection

A view of the North American Aviation O-47 assembly line at the factory in Inglewood in 1938. The factory floor space had been expanded to double the size of the original 1936 factory floor. The growing number of orders for the O-47 and the trainers accelerated the need for expansion, contrary to "Dutch" Kindelberger saying "I don't want the biggest aircraft factory, but I do want the busiest".

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION
Retirees Bulletin

Fall 2006

Inside: **A HISTORY OF THE X-15** by Bill Dana

INNOVATORS OF WORLD WAR II PRODUCTION by Paul McCormick

F-107A WEAPONS SEPARATION TESTS by William Simone



NASA Photo

As NASA project pilot on the hypersonic X-15 research aircraft, Bill Dana flew the rocket-powered vehicle 16 times, reaching a top speed of 3,897 mph or Mach 5.53 and a maximum altitude of 307,000 feet. He qualified for astronaut wings and was the test pilot on the 199th and final X-15 flight of the ten-year program.

NORTH AMERICAN AVIATION
Retirees Bulletin

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DEAR NAA RETIREE BULLETIN SUBSCRIBER

Another year is more than half over and our numbers continue to diminish as more of our friends and colleagues leave our midst. However, we are heartened by the fact that we had them with us to share in our joys and our sorrows. Our company, North American Aviation Inc., no longer exists. All traces of it continue to melt away with the years. But, we know who we were and who we are—the very best in the industry. Many of you let us know that you enjoyed the look back at our beginnings in the last issue.

Speaking of moving on—many of you continue to move around and fail to notify us of your new address or provide it in such a terse manner that we lose contact with you. Please do not rely on the phone—send us a card with your old and new address. We have several "Lost Sheep" copies which were returned with no explanation except that they could not be delivered to the addressee.

We have just received word that the entire Boeing Anaheim operation will be moved to the Huntington Beach facility. The N&IS group will move in Mid-2007 and the CBM group in 2008. It appears that the only former NAA facility left will be Seal Beach.

Whenever we think of the X-15, we always think of Scott Crossfield as the test pilot associated with that aircraft. However, there were twelve test pilots that participated in the X-15 flight test program. As the NAA pilot, Scott was the first but others followed and completed the 199 X-15 missions flown. The complete list, their affiliation and the number of X-15 flights are as follows:

Maj. Michael J. Adams	USAF	7
Neal A. Armstrong	NASA	7
A. Scott Crossfield	NAA	14
William H. Dana	NASA	16
Capt. Joseph H. Engle	USAF	16
Capt. William J. Knight	USAF	16
John B. McKay	NASA	29
Cmdr. Forrest S. Peterson	USN	5
Maj. Robert A. Rushworth	USAF	34
Milton O. Thompson	NASA	14
Joseph A. Walker	NASA	25
Capt. Robert M. White	USAF	16

We asked Bill Dana of NASA to provide us with an article relating his experiences with the X-15 and he very graciously accepted the invitation, providing us a brief history of this airplane. Our F-107A expert and author, Bill Simone, came up with an article on the F-107A Weapon Separation Tests. Going back to the early days of World War II, Paul McCormick gives us a compelling look at how the people at NAA innovated methods to mass produce airplanes in record time.

Almost Time To Renew Your Subscription?

If the date above your name on the back page is December 2006, the Winter Issue will be your last issue and you must renew to continue receiving the Bulletin. As you know, Sonnie Robertson is the only person on our small staff of volunteers that handles all matters related to subscriptions. It would be a tremendous help if you would renew early to avoid the huge dump of renewals after the first of the year and the need for her to send out reminder cards in February.

NAA/Rockwell Vandenberg AFB Reunion

All NAA/Rockwell former and retired employees are invited to a Vandenberg AFB reunion to be held from 6:00 PM to 11:00 PM on Friday, October 20, 2006. There will be a no-host bar and dinner will be a tri-tip/chicken buffet. Cost is $25.00 per person and includes tax and tip. For details, contact Marv Bailey at *marvnmac@charter.net* or (805) 929-6552 or Al Finlay at *hotrod40@verizon.net* or (805) 937-3690. All tickets must be prepaid by October 6, 2006.

Don't miss this one, it probably will be our last hurrah!

NAA/ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Frank Zelinski at (562) 866-3195.

The Antelope Valley Retirees Club meets in the South Meeting Room of the Palmdale Culture Center at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell/Boeing retirees are welcome.

Valley Aerospace Retirees Club meets on the 3rd Thursday of each month at the Pratt & Whitney Rocketdyne Fitness Center at 8500 Fallbrook Avenue, Canoga Park, CA. The president is Dennis Larson at (818) 340-6031.

Boeing Retirees Breakfast Club meets on the 1st Wednesday of each month at 8:00 AM for breakfast at IHOP Restaurant, corner Fallbrook and Vanowen in West Hills. Contact Howard Seese at (818) 344-7861.

"The Old LAD Stress Group" meets for breakfast approximately every two months at Mimi's Café in Torrance, CA. If you are from the old LAD Stress Group contact Gene Laxton at (310) 378-3113 or Ed Rosenthal at (310) 375-8933.

"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meet at 11:30 AM on the 2nd Wednesday of the month for lunch at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd. and Mariposa Ave.

The NAA 101 Tooling Retirees Group meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at Billy's Restaurant, 5160 190th St., west of Anza Avenue in Torrance, CA.

GPS Breakfast Club meets from 7:00 AM to 8:00 AM every Wednesday at the new Primrose Restaurant, Leisure World Shopping Center at Seal Beach Blvd. and Westminster Blvd. All are welcome! For more information, call Fred Shitara at (714) 746-4426.

Seal Beach Retirees Group meets at 11:30 AM on the 3rd Wednesday of the month at "The Fish Co." on Los Alamitos Blvd. at Katella Avenue. For more information call Marvin Blaski at (714) 848-5717 or e-mail to *mblaski@aol.com*.

The Facilities, Industrial Engineering and Plant Services Retirees Group meets at 11:45 AM on the 2nd Thursday of each month at Buster's (formerly Jolly Roger's) Restaurant in the Long Beach Marina. Contact Joe W. Mausser at (562) 596-5845.

"Ye Olde Pharts Breakfast Club" meets at 10:00 AM on the 4th Thursday each month for breakfast at Polly's Pies at 2025 N. Tustin Avenue in Orange. For information call Frank Luis at (714) 639-0990.

The North American Rockwell Retiree Club of McAlester, OK (a satellite of Tulsa, OK) meets at 10:30 AM on the 3rd Tuesday in March, June, September and December at the Down Town Meeting Place. Call J.A. Darden at (918) 423-0706 for more information.

Tulsa & McAlester Retirees meet for breakfast at 8:00 AM on the 2nd Monday in March, June, September and December at the Ramada Inn, 8181 East Skelly Drive in Tulsa, OK. Call Harry Phillips at (918) 838-3716.

The North American Rockwell Retirees Group of Columbus, OH Engineers and Professionals meet at 11:30 AM on the 3rd Thursday of each month at the Berwick Park House. Contact Byron C. Solomides at (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH meets at Noon on the 1st Monday of the month at the Whitehall Community Park on North Hamilton Road in Whitehall. Contact E. Hamilton at (740) 927-5940 for information.

Autonetics Group including Marine Systems, Program Office, Project Office, System Test, Engineers and Designers meets for lunch on the last Wednesday of each month at the HomeTown Buffet, Rose Ave. and Alta Vista Dr. in Placentia, CA. Call Mike Vohs at (714) 762-1925 for more details.

Autonetics Industrial Engineering and Maintenance Retirees meet for lunch on the 1st Thursday of each month at the HomeTown Buffet, 390 McKinley, located in front of the Home Depot, in Corona, CA. For more details, call Don Burk at (909) 698-0072.

Autonetics Retirees meet for lunch at 11:45 AM on the 2nd Wednesday of every month at the Rembrandt Restaurant or Yorba Linda Country Club. All Autonetics retirees, spouses and friends are invited. Contact Robert Nease at (714) 516-1844 or e-mail to *rfnease@email.msn.com* or Ed Venanzi at (714) 779-5652 or e-mail to *Ed-LindaVenanzi@adelphia.net*.

A Group of NAA Retirees meets for breakfast at 8:15 AM on the 1st Wednesday of each month at Knott's Berry Farm-Chicken Restaurant. All are cordially invited. Contact Maxine Haun at *maxi3131@sbcglobal.net*.

Autonetics Financial Luncheon Group meets for lunch at Noon on the last Wednesday of the month at Marie Callendars, 126 East Yorba Linda Boulevard in Placentia. Contact Ken Cantwell at (714) 970-7171 or e-mail *Kcantwell@adelphia.net*.

A Group of Engineering Mgt. meets at 11:30 AM on the 3rd Tuesday of the month for lunch at Denny's on Imperial Hwy. and the 57 Fwy. in Brea. Call Earl England at (714) 528-0614 for information.

NAA Tech Reps Assn. (TRA) Breakfast Club meets at 9:00 AM on the 1st Tuesday of each month at the Carlsbad Airport Restaurant. For more information, call El Presidente Rafael Colunga at (760) 940-0525.

Material Group Retirees from Downey and Seal Beach meet at 11:30 AM on the 4th Wednesday of every month at the Stox Restaurant at Imperial Hwy. and Bellflower Blvd. in Downey. Contact Marian Nielson at (562) 429-1020 or Joan Dominguez at (562) 865-7200.

NAA/Rockwell Vandenberg AFB Retirees Breakfast Club meets at 8:45 AM on the 2nd Thursday of each even month at the Bakers Square Restaurant at 1841 S. Broadway in Santa Maria. Contact Marv Bailey at (805) 929-6552, Al Finlay at (805) 937-3690 or Bob Broggie at (805) 937-4674.

KSC Rockwell KMA Club meets on the 2nd Thursday of each month for lunch at the Florida Seafood Restaurant in Cocoa Beach. Contact Jerry Pruitt at (321) 636-9417 for details.

The Hangar Gang meets at the Proud Bird approximately every 4 months. For time, date and other details, call Gene Salvay at (818) 788-3974 or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

ANNUAL EVENT

Bald Eagles 45th Annual Reunion will be held on Saturday, April 14, 2007 at the Proud Bird Restaurant. Call Val Yarbrough at (805) 646-2283.

Flight Test Instrumentation Annual Reunion – This group of retirees meets annually at the Fullerton Elks Club. For information, call Frank Vigil at (562) 691-0236.

Tech Rep Association Picnic – A group of retired Field Service Technical Representatives has a yearly picnic in June at a park in Fallbrook, CA. For more information, call TRA President Rafael Colunga at (760) 940-0525 or e-mail to *rafael2@peoplepc.com*.

The Annual M&P, P.D.L., "Friends Christmas Luncheon" – This group assembles in mid-December for a festive luncheon. Those wishing to participate and receive notice of the next December luncheon, call Fred Koeller at (310) 545-8854.

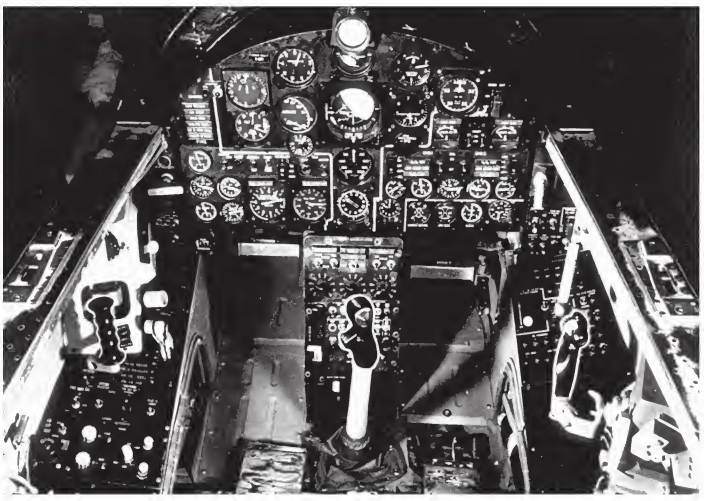
NAA Flying Horsemen 22nd Annual Reunion will be held on September 28-30, 2006 at Harry Shapiro's home in Yorba Linda, CA. For details call (714) 993-3496 or e-mail to *shapsplace@aol.com*.

Information Systems Center Annual Reunion will be held Tuesday, May 15, 2007 at Khoury's Restaurant in Long Beach Marina at 4:30 PM. Contact Nelson Slagle at (714) 514-9139 or *neslagle@hotmail.com*.

A History of the X-15

by Bill Dana, with NASA photos provided by Tony Landis

Editor's Note: This splendid review of the X-15 performance as experienced through the eyes of a test pilot was drawn from a speech given by Bill Dana at the Smithsonian Institute. Although we tend to relate all X-15 flight testing to NAA test pilot Scott Crossfield, twelve test pilots participated in this program, including Bill Dana.



The X-15 flew to an altitude of 354,000 feet and reached a Mach number of 6.70. It flew its last flight almost forty years ago, but to this day, except for the Space Shuttle and *SpaceShipOne*, no aircraft has flown half as high nor half as fast. The late Dr. Hugh L. Dryden termed it "the most successful research airplane in history."

The initial effort to develop a hypersonic aircraft began in 1952. It was the year of the first flight of the YB-52, and the aeronautical community was struggling to advance aircraft speeds from Mach 1.5 to Mach 2. Men of vision, however, were already looking to the higher speeds and altitudes that would eventually take us to orbital flight. For it was that year that the National Advisory Committee on Aeronautics (NACA) recommended an increase in research dealing with flight to speeds of Mach 10 or 12 and to altitudes from 12 to 50 miles.

In 1954, NACA submitted to the Air Force-Navy-NACA research airplane program a technical proposal for a hypersonic research airplane. The plan was accepted in December 1954 and the Air Force issued invitations to industry for the design and manufacture of a hypersonic research airplane. Several contractors submitted proposals with maximum speeds in the Mach 6 to Mach 7 range.

The ultimate winner of the contract was North American Aviation, and the result was the X-15. The X-15 program called for the production of three aircraft designed for a speed of Mach 6.6 and an altitude of 250,000 feet. The Mach 6.6 represented the maximum speed that state-of-the-art structures could support and the 250,000-foot altitude was an arbitrary design point which would force adequate attention to exoatmospheric control and to reentry techniques.

The X-15 was 50 feet long and had a wingspan of 22 feet. It weighed 33,000 pounds at launch and 15,000 pounds empty. It's flight control surfaces were hydraulically actuated and included all-moveable elevators, all-moveable upper and lower rudders (the lower rudder extended below the landing gear and it had to be jettisoned before landing), speed brakes on the aft end of the fixed portion of the vertical fins, and landing flaps on the trailing edge of the wing. There were no ailerons; roll control was achieved by differential deflection of the horizontal tail.

All three X-15s were delivered with simple rate-feedback damping in all axes. The Number Three X-15, however, was extensively damaged during a ground engine run before it ever flew. When it was rebuilt, it was fitted with a self-adaptive flight control system which included command augmentation, self-adaptive damper gains, several autopilot modes, and blended aerodynamic and ballistic controls.

The X-15 was designed as a "hot structure", that is, the structure served as a heat sink for aerodynamic heat loads. These loads could have been reduced by insulation or by cooling, but the hot structure offered a more attractive concept in terms of knowledge to be gained in the areas of aerodynamic heating and elastic behavior. The structural material was Inconel X, a nickel-chromium alloy slightly heavier than steel selected for its load-carrying capability at high temperature. The exterior surface of the aircraft was painted black for better re-radiation of aerodynamic heat loads.

The X-15 engine was an XLR-99 single chamber rocket. It produced 60,000 pounds of thrust and it burned 18,000 pounds of liquid oxygen and anhydrous ammonia in 85 seconds. The propellants were fed by a steam driven turbopump. The source of the steam was hydrogen peroxide decomposed by passing through a silver screen catalyst bed.

Two other steam turbines, called auxiliary power units, each furnished hydraulic pressure and the electrical power for the X-15. Their propellant also was decomposed hydrogen peroxide. Liquid nitrogen was used for cooling the payload bay, cockpit, windshields, and nose. Steam rockets in the nose and wings provided altitude control when out of the atmosphere.

In the cockpit photo above, the three flight controllers are outlined. The center stick provided conventional pitch and roll control, and was intended for use after engine burnout. Mechanically linked to the center stick was a right-hand controller used during the boost. When the pilot was using the side controller, the back of his right elbow was braced to not allow aft movement; this prevented the mass of the pilot's forearm and hand from causing spurious pitch inputs in the acceleration field existing during boost. On the left side of the cockpit was a three-axis ballistic controller, which was mechanically linked to steam rockets in the nose and wings.

On the instrument panel was an attitude indicator whose source was inertially derived. Also provided were inertial velocity, altitude, and rate-of-climb. Barometric instruments included an altimeter and a combined Mach-airspeed indicator; these instruments were usable only below about 75,000 feet and were used mainly in the traffic pattern. An angle-of-attack and a sideslip indicator were provided; the source of these two instruments was selectable, inertial for high altitude flight and barometric for the end of the mission.

The X-15 was actually the second stage of a two-stage system. The first stage was a B-52 bomber, specially modified for the



program, which carried the X-15 uprange into Nevada, pointed it towards Edwards, and launched it at 45,000 feet and 0.8 Mach number.

During a typical mission, the X-15 was launched about 200 miles from Edwards. The engine was lit immediately after launch and burned for about 85 seconds. During that period, it would boost the X-15 to an altitude of 160,000 feet and a Mach number of 5.4. The X-15 would then coast to 250,000 feet, reenter, and glide to a landing on the dry lake at Edwards. A typical X-15 flight lasted eleven minutes, including about four minutes in the traffic pattern.

The X-15 first flew on June 8, 1959, and within four years had completed all the objectives of the original research program. It reached a Mach number of 6.06, which due to weight growth was less than the Mach 6.6 design speed, but it also reached an altitude of 354,000 feet, some 40 percent higher than the program goal of 250,000 feet. The altitude capability was made possible by the blended aerodynamic and reaction controls of the self-adaptive flight control system in the X-15 No. 3. Only X-15 No. 3 flew significantly above 250,000 feet.

The following paragraphs describe some of the issues anticipated with the X-15 prior to the first flight and how the X-15 fared in these areas.

The mechanics of atmospheric exit and entry were quite straightforward. The pilot flew a constant pitch altitude to engine burnout, then an angle-of-attack schedule—a low angle-of-attack to peak altitude, and a high angle of attack for reentry. Reentry angle-of-attack varied from 15 to 26 degrees, depending on peak altitude.

There were some aeromedical effects of interest during boost. One was the ability of the pilots to function in the acceleration during boost. After engine light, the pilot was under 2g chest-to-back acceleration which increased to about 4g at burnout. The pilots felt that 4g's was about enough. Milt Thompson once stated that, "The X-15 was the only aircraft I ever flew where I was glad when the engine quit."

The fact that the X-15 pilots were willing to call 4g's of axial acceleration a limit when current-day fighter pilots fly and fight in much higher normal acceleration environments may have been due to another phenomenon concerning X-15 power-on flight—the phantom pitch rate perceived during the boost. In the absence of a horizon reference, the pilot tends to define "down" as the way acceleration is forcing him.

When the X-15 pilot lost sight of the horizon during pullup, the acceleration along the flight path gave the pilot the sensation of pitching steeply up. As the acceleration increased during fuel burn, the pilot had the sensation that the X-15 was rotating even more steeply up. This was a fundamental sensory illusion and there was no cure for it. Strict reference to the flight instruments was required until engine shutdown to prevent the pitch rate illusion from ruining the flight profile.

Entry was a less-demanding pilot task. There was no acceleration due to thrust and the horizon was in view throughout. At constant angle of attack, the normal acceleration gradually built up to 5g's and then was maintained there (usually for a period of about 15 seconds) until the X-15 had broken its fall. It might be noted that the X-15 pressure suit was equipped with an integral g-suit.

Control Outside the Atmosphere: There were no serious problems controlling the X-15 using the ballistic control rockets. Care had to be exercised to keep angular rates small, because the task could get confusing while attempting to control all three axes simultaneously. The main problem with ballistic flight was that the airplane was neutrally stable and the pilot was the only thing keeping the X-15 pointing down the flight path. X-15 No. 3 had aerodynamic and ballistic controls blended automatically through the autopilot, one of whose features was heading-hold mode so that as far as the pilot was concerned, X-15 No. 3 was directionally stable while ballistic.

Control at Zero Gravity: It turned out there were no control problems at zero gravity, nor were there any other problems related to weightlessness. There was no pilot nausea, as later occurred in the Apollo program. There was one humorous incident where the pilot hit the latch on his checklist binder while shutting down the engine, he thereby released 27 pages of checklist that floated around the cockpit for the two minutes before the weightlessness ended.

Aerodynamic and Structural Heating: During the entire program, the X-15s were exposed to surface temperatures as high as 1,350 degrees F and all the airplanes exhibited minor buckling of the exterior skin. During the rocket boost phase of the flight, when the aircraft was accelerating and heating rapidly, the pilot could hear this skin buckling. As Joe Walker observed, "The airplane crackled like a hot stove."

The leading edges of the wing were formed in several pieces and had small slots between segments to allow thermal growth. These slots tripped the boundary layer and caused high temperature and skin buckling downstream of the slots. The slots were eventually capped and an additional rivet was added behind the slot, curing the problem.

On two occasions the right outside window pane crazed, forcing the pilot to fly and land with only left-hand vision. Buckling of the window frame caused this crazing. The Inconel frame was replaced by one of titanium, which had a lesser thermal expansion and which prevented further recurrences of window crazing.

Simulation: For planning X-15 flights and for pilot practice, extensive use was made of a fixed base analog simulator. Every flight was preceded by ten or twenty hours of simulation of normal and emergency procedures.

The simulator had to be continually updated with data gathered in flight. For example, early simulation based on wind tunnel data indicated that the X-15 would be flyable with the lower rudder turned on and the roll damper turned off. Flight test proved this not to be the case. When the roll damper was turned off, a test also revealed that the lower rudder was not required for directional stability. The lower rudder was dis-

carded, the X-15 then became stable even with a roll damper failure, and the simulator was updated to reflect the actual aircraft characteristics.

Landing: Prior to the X-15 flight program there was considerable reservation about the pilot's ability to consistently land a power-off, low lift-drag ratio airplane. The X-15, however, had good handling qualities and large variable deflection speed brakes and it proved easy to land. All the pilots used a circling approach that was commenced at 30,000 to 50,000 feet above the runway and they stayed high on profile until it was assured that they would reach the runway, at which time speed brakes were used to descend onto a nominal glide-slope. The landing gear was left retracted for drag reduction until the landing flare was complete and the aircraft was in level flight.

There were 196 successful landings in the program, and the two landing accidents that occurred were related to system or structural failures and not to pilot error.

The first accident happened early in the program, when an engine explosion occurred during engine start, and the pilot was forced to land at the launch lake. Not all of the propellants jettisoned and the oil in the nose strut had become aerated. Thus, the aircraft was heavyweight and the nose strut did not provide the shock absorption it was designed for. In spite of this, the damage was minor and the airplane was back in the air in three months with a modified nose strut able to handle the landing loads.



The second landing accident again was caused by engine failure. Here, the fuel was jettisoned but the landing flaps failed to extend. The landing was, therefore, fast and the high download on the main gear after nose wheel touchdown combined with a faulty weld, caused the left main gear to fail. The aircraft veered sideways and rolled over, damaging the wings, destroying the tail surfaces, and injuring the pilot, who suffered three crushed vertebrae. The pilot was back on flying status within six months and was soon back in the X-15 program. The rebuilding of this X-15 will be described later.



By 1963, the design objectives of the X-15 had been met, and for the last six years of its life it served mainly as a test bed for other experiments. These experiments were mostly space-related and varied from a pod that was carried on one wingtip with which it was attempted to capture a micrometeorite, to a top-looking camera for photographing stars.

The most interesting X-15 follow-on experiment was the ramjet engine that was planned to be tested on the X-15A-2. This is a photograph of the X-15A-2 which was rebuilt from the X-15 that rolled on its back after the landing gear failure. The fuselage was lengthened 29 inches to make room for a hydrogen tank that was to provide fuel for an air breathing ramjet engine to be mounted on the ventral fin. Like the lower ventral fin, the ramjet had to be jettisoned prior to landing.



The ramjet rode well, but with the added structural weight and drag of the ramjet, the maximum speed of this configuration was just over Mach 5, and it was desired to test the ramjet at Mach numbers of 6 to 8. In order to accommodate this increased performance, two external fuel tanks were added.

These droppable tanks carried an additional 13,000 pounds of propellants. They were carried until empty at about 70,000 feet and Mach 2, at which time they were jettisoned and the bare X-15 had full internal fuel with which to accelerate from that starting point. One flight was launched in the configuration shown here and flown to a Mach number of 6.33. The next flight was to exceed the original design speed of Mach number 6.6, which meant that the structure had to be heat-protected.



A silicone elastomeric was sprayed over the entire exterior of the airplane. This coating was designed to ablate during the high Mach portion of the flight and to carry some of the heat load with it. The white X-15 was flown one time to a Mach number of 4.94 to check the integrity of the thermal protection and then was flown in the configuration shown here, to a Mach number of 6.70. It was the fastest speed achieved in the X-15 program.

Portions of the skin of the ventral were burned through and there was substantial damage to substructure and to subsystems enclosed in the ventral fin. The X-15A-2 was returned to the North American factory at El Segundo for repair. Although the repairs to the damaged structure were complete, the X-15 program had been cancelled. The X-15A-2 never flew again and the actual working ramjet was never flight-tested.

The flight resulting in all the heat damage occurred in October 1967. In November of that year X-15 No. 3 launched on what was planned to be a routine research flight to evaluate a boost guidance system and to conduct several other follow-on experiments. During the boost, the airplane experienced an electrical problem that affected the flight control system and inertial displays. This distracted the pilot and may have caused him to misinterpret other displays. At peak altitude, the X-15 began a yaw to the right, and it re-entered the atmosphere yawed crosswise to the flight path. It went into a spin and eventually broke up at 65,000 feet, killing the pilot. The tragic event, in retrospect, was the death knell for the entire project. Program management decided not to fly the X-15A-2 again and to fly the X-15 No. 1 only for calendar year 1968.

On October 24, 1968, X-15 No. 1 flew a successful research flight to accomplish the 199th flight of the program. There still remained two months of the year in which to pass the 200-flight milestone. But a series of problems involving the experiment, the inertial reference system, and the weather combined to keep the X-15 on the ground, and time finally ran out on the most successful research airplane in history.

About the Author: After graduating from the U.S. Military Academy, Bill served as a pilot in the U.S. Air Force. He joined NASA as an aerospace research pilot after receiving an MS degree from USC in 1958. At NASA's Dryden Flight Research Center, he flew many advanced aircraft, including the F-100 variable stability research aircraft, the F-16 Advanced Fighter Technology Integration aircraft, the F-15 HIDEC and the F-18 High Angle-of-Attack aircraft. He was a project pilot on the X-15 and the manned lifting body wingless vehicles. He retired from Dryden in 1998 as Chief Engineer after 40 years of distinguished service. A member of the Society of Experimental Test Pilots, he has been recognized with many awards and medals including the Milton O. Thompson Lifetime Achievement Award, the Haley Space Flight Award and the NASA Exceptional Service Medal. Although retired, he still maintains an active desk at NASA Dryden and resides with his charming wife, Judi, in Tehachapi, California.



Photo courtesy of the AFFTC History Office

Three major figures in hypersonic aircraft research hold an informal review in the 1950s at Edwards Air Force Base. All three hold engineering degrees, are veteran service pilots and are assigned as test pilots for America's latest hypersonic aircraft. Al White (left), NAA, will test the F-107 and the B-70; Captain Iven Kincheloe (center), USAF, will test the F-101; and Scott Crossfield (right), NAA, will test the X-15. All three were exceptional in achievement, yet modest in acclaim. They were and are America's heroes!

The Innovators of World War II Production

by Paul McCormick

It was the best of times. It was the worst of times. It was the Great Depression. In the early 1930s, Curtiss, Douglas, Martin and Boeing were growing. Newcomers like Grumman, Seversky and Vought were just getting started. Others were closing their doors for lack of business.

Two of the losing companies were Fokker and Berliner-Joyce. Fokker had been successful until one of his planes crashed, killing fabled Notre Dame football coach, Knute Rockne. As a result, Fokker's sales declined and he lost control when his F-10 airplanes were grounded. The name was then changed to General Aviation. Berliner-Joyce built some advanced prototypes but was beaten out by Curtiss for production contracts.

Eddie Rickenbacker, the World War I ace, was trying to get North American Aviation started again after it went into receivership. He proposed to his friend Ernie Breech, general assistant treasurer of General Motors, that General Motors buy the company. The Board of Directors accepted the proposal and bought into North American Aviation. Breech had himself appointed chairman of the board and president while Eddie Rickenbacker was appointed vice president of public relations. The two companies, Fokker and Berliner-Joyce, were put together in Dundalk, Maryland and became the manufacturing division of North American Aviation.

Not knowing much about airplanes, Breech hired some top engineers from other failed companies to help him out. Unfortunately, no new products with any potential appeared.

Then, Breech made a decision that was destined to rock the aircraft industry. He offered the presidency of North American Aviation to James H. "Dutch" Kindleberger who was the engineering vice president of Douglas Aircraft. He had just leaped ahead of Boeing's 247 airliner by winning the competition with a new revolutionary DC-1 for TWA and the DC-2



Photo from the Paul McCormick Collection

North American Aviation Manufacturing Management at the Los Angeles Division lined up in front of the latest P-51 in 1944 including (left to right) Asst. Supt. Ken Shaw, Asst. Supt. John Stoner, Asst. Supt. Joe Corral, Asst. Supt. Reubin Bierke, Asst. Supt. Rod Stronks, General Supt. Dick Seifried, Supt. Jimmy Ray, Supt. Rudy Karst, Asst. Supt. Paul McCormick, and Asst. Supt. John Anderson.

for American Airlines. Dutch brought Lee Atwood with him for engineering and Stan Smithson for production.

When Dutch surveyed the assets of North American Aviation, he found no planes that held any future and, thereby, realized he was starting at the bottom.

Dutch did have one great asset though. It was the skilled and dedicated work force from Berliner-Joyce and Fokker that was anxious to get another chance. Bob McCulloch, an immigrant from Scotland who joined Fokker in 1927 as a skilled mechanic and moved into factory supervision, was named the general shop foreman of North American Aviation. Prior to coming to the United States, McCulloch had completed a five year apprenticeship course in marine engineering. Then he joined Beadmore Naval Construction Company, working on their all-metal tri-motor Sea Plane "Inflexible" which had a 150-foot wingspread.

Dutch also had many immigrants from Germany including Dick Seifried, Rudy Karst, Hans Ludwig, Dick Thaiss and John Wonderlick. All would move into supervision. Then there were the tool makers, Ralph Ruud, Julius Kany and Carl Walterhoefer, who all had started with Berliner-Joyce in 1931, and Fredrick Westermeir who would make great waves and Edgar Schmued who would become the chief designer of the P-51 Mustang.

This gang and many others built the prototype NA-16 basic trainer which became the BT-9 in an unbelievable record time of nine weeks and won the contract over the Severesky BT-8 which was already in production.

On the strength of the BT-9 contract, Dutch moved back to the West Coast, building a new plant at Mines Field. Dutch had visited the European aircraft factories in the mid-1930s and preferred the German Messerschmitt production methods over the British Supermarine methods. He favored building his airplanes up as sub-assemblies and making system installations before mating. He directed this concept into the design of the B-25 Mitchell bomber and the P-51 Mustang fighter, thereby setting the pattern for rate production.

Manufacturing at the new plant was headed by Stan Smithson as works manager. Bob McCulloch was promoted to factory superintendent and Bob Dawe headed quality control. Then Bob McCulloch was promoted to factory manager. He was responsible for production of the BT-9, O-47, BC-1, British Harvard, the B-25, NA-73X prototype and P-51 production. But it didn't last long because Bob McCulloch was pulled away by an offer from Vultee Aircraft. This caused an immediate vacuum and Stan moved Bob Dawe in as factory manager to take over.

The B-25 and the P-51 were sheet metal airplanes and the sheet metal experts had moved up into management positions. Dick Seifried moved from general foreman to general superintendent. His departments included not only sheet metal and subassembly but also wings, fuselages, tail surfaces and everything except final assembly and test flight. Final assembly was headed by Jerry Loring and Gary Stroh.

Dick Seifried made a major contribution to the war effort when he invented and developed a hydrolytic stretching machine for forming extrusion and sheet metal parts. He selected the Hufford Company to manufacture and sell the machines. They were installed at North American Aviation and also made available to the entire aircraft industry. The Hufford stretch presses materially reduced the man-hours required to produce extruded and sheet metal parts and attained a higher degree of quality. Dick was supported by Norris Chase in machined parts and Andy Cassidy in tooling. Rudy Karst moved up to superintendent over sheet metal and subassembly. Carl Walterhoefer was foreman of experimental with Dick Thaiss and John Wonderlick as assistant foremen when the NA-73X was built in record time. As the programs moved up to rate production, Ralph Ruud moved up from chief tool designer to assistant factory manager to help Bob Dawe get the job done.

With three plants running in Inglewood, Kansas City and Dallas, Dutch hired Bob McCulloch back as chief trouble shooter and sent him to Kansas City to help out with production problems on the B-25. Then he was sent to Dallas to take over as plant manager on the AT-6, P-51 and B-24 and move these programs to peak production. After the war, McCulloch stayed in Dallas and formed the Texas Engineering and Manufacturing Organization known as TEMCO which later merged into Ling-Temco-Vought.

After the war, Bob Dawe moved back to Inspection and reported to Dutch. Stan Smithson assumed the title of Factory Manager with Ralph Ruud as assistant factory manager.

The company had produced over 45,000 airplanes during World War II, each the best in their class. These planes included the best fighter, best medium bomber and best trainer. In addition, the P-51 shortened World War II and cleared the European skies of the dreaded German Luftwaffe, the only fighter which could fly deep into Germany and return to English bases. The greatest build-up of aircraft production had ended, contracts were cancelled, the Kansas City and Dallas facilities were closed and layoffs were completed. After cutting employment from 91,000 to 5,000 persons, the company had to start over again in the Jet Age. The Jet Age and Columbus is another story.

Job well done!

About the Author: at the age of twenty, after working at Luscombe, Sikorsky and Hall Aluminum Aircraft on the East Coast, Paul McCormick accepted a job in September 1937 at North American Aviation. He was placed on assembly of the BT-9 engine cowling and rose to general foreman of the cowling department. At the peak of P-51 production, Paul advanced to assistant superintendent and managed five departments and 2,500 people. In December 1950, Stan Smithson offered Paul the position of superintendent of sheet metal at the Columbus plant. He accepted the offer and moved his family to Columbus. He currently resides in Worthington, Ohio.

New Long Beach Fitness Center

A new Boeing Fitness Center has been opened in Long Beach outside the gates and is **open to retirees** and their dependents. Hours of operation are Monday through Thursday 5 AM to 8 PM, Friday 5 AM to 7 PM. The center is not open on weekends. The center offers a complete regimen for cardiovascular programs and strength and weight training. Outdoor amenities include tennis courts, basketball courts, sand volleyball, and running/walking track. The center is located at 2019 E. Wardlow just east of Cherry Avenue.

F-107A Weapon Separation Tests

by William J. Simone

The second F-107A, S/N 55-5119, was assigned the task of weapon testing. This included the evaluation of centerline store separation characteristics. North American Aviation had designed the F-107A around a low drag semi-submerged centerline store. This combination allowed the maximum use of space and reduced the complex structure associated with a bomb bay. In 1955, National Advisory Committee on Aeronautics (NACA) wind tunnel testing indicated that satisfactory supersonic releases of streamlined stores were very difficult, if not impossible. Since the F-107A had been designed around the streamlined store, this information aroused considerable concern.

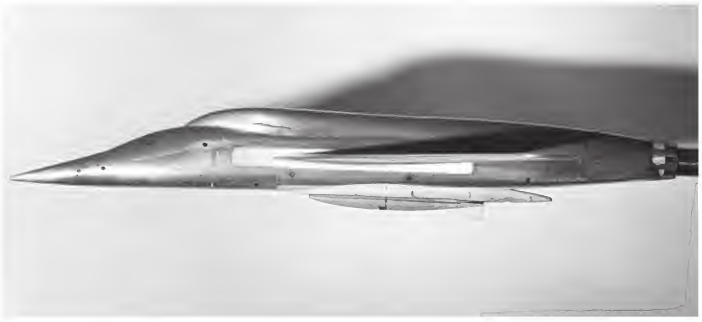


Photo from the William J. Simone Collection

The F-107A Special Store separation wind tunnel model. Conditions were Mach 1.87 at an altitude of 24,500 feet, using 10,000 pounds of ejection force.

Another series of weapon separation wind tunnel tests were conducted by North American in order to investigate the problems outlined in the NACA report. The results were more favorable than NACA had predicted and, accordingly a joint NAA-USAF weapon separation test program was set up using F-107A 55-5119. This program called for several store drops, utilizing the 250-gallon centerline saddle tank, special store combination configuration. Al White, who would later become the project pilot on the Mach 3 XB-70A, was assigned as the weapon testing project pilot. Testing was staged out of the North American Flight Test Center at USAF Plant 42, Palmdale, California with the drop site at both China Lake NAS and the Sandia Salton Sea Range. The program was designed to test both the Low Altitude Bombing System (LABS), and level flight drop techniques with each flight calling for an increase in speed.

The weapon to be dropped was the semi-submerged TX-28 thermonuclear weapon. This weapon was scheduled to be carried on the production F-107A. The TX-28 store, which was tested at weights of 1,735 and 2,138 pounds, was designed to give the pilot the greatest separation between the aircraft and it's nuclear blast, without flying a LABS-type maneuver.

The 'TX' is an acronym for Test Experimental, a designation assigned to a nuclear warhead as long as it is in test status or for the duration of tests of a modification to the basic design, a generic prefix to the weapon number which designates the special development model of a new weapon. When the weapon reaches the production stage, the TX designation is changed to a Mark (MK) or W prefix. The TX-28 production weapon was designated MK-28.



Photo from the William J. Simone Collection

The fuselage centerline station could be equipped with a semi-submerged 500-gallon fuel tank or a combination of a special store and a 250-gallon non-jettisonable centerline saddle fuel tank. Shown here is the TX-28 thermonuclear weapon.

On January 9, 1957, F-107A 55-5119 made its seventh flight and first weapon drop. The store was dropped successfully from 35,000 feet at 0.9 Mach number. The level flight drop was very clean with an error of 0 feet range and 800 feet right. There were no transient pitch changes.

On January 14, 1957, the ninth flight was made. The centerline store was dropped at 1.15 Mach from 15,000 feet. Again, no problems were encountered. Later that same day, on Flight No. 10, dives from 40,000 feet at 0.8 Mach and dive angles of 35, 42 and 50 degrees were successfully conducted.

During Flight No. 12 on January 15, 1957, the first LABS test was performed from 8,000 feet. The store was released at 0.9 Mach during the 4g LABS maneuver. The error was again range 0 feet short, 700 feet right. This remarkable accuracy was obtained without the aid of a fire-control system. It was followed the next day by another LABS. This test was performed at 15,000 feet and 0.9 Mach number while the aircraft was pulling 2g in the LABS maneuver. The error was 5,000 feet short, 1,000 feet right.

Later that same day, Al White attempted another LABS, but had to abort because of Augmented Longitudinal Control Sys-

tem (ALCS) problems. This flight was scheduled to have been a V_{max} drop. Instead a 42-degree dive bomb run from 40,000 feet was made. Store separation occurred at 20,000 feet. The error was 1,100 feet short, 200 feet right.

With ALCS repaired, the first V_{max} (Mach 2+) drop was again attempted on January 21, 1957. Al White was again the pilot on 55-5119 for the sixteenth flight—a flight he would recall for years. The flight started out very normal with no problems except for a small leak in the Constant Speed Drive (CSD) unit. This had caused smoke in the cockpit on the previous flight, but now things were about to change drastically!

In his July 4, 1999 letter (and used with his permission) to the author he recalled the event. *"The dead stick landing that I made in the F-107 was during an attempt to drop the centerline store at Mach 2. As you know we were in a competition with the F-105, and wanted to drop a store at Mach 2 at the time when the F-105 was limited to around Mach 1.85. The drop was to be called out by radar operator on the ground. The two North-South highways in the valley were temporarily closed, and I went over to around Santa Barbara and started the run. I was well into it when the radar operator lost me. I turned back and when he found me again I started another run. I was at about 1.96 Mach when I looked at the fuel gage. It was reading about 600 pounds and for that big engine running in AB, that's not much fuel. I called an abort, came out of afterburner, and a couple of seconds later the engine flamed out, even though the fuel gauge still indicated that I had a little fuel remaining. By the time I gathered my wits I was going away from Edwards at over 1.8 Mach. The lakebed was full of water and unusable; so I made a sweeping turn to the left and started back towards the base. Around 20,000 feet I knew I could make the runway at Edwards, so I tried an airstart. It didn't start immediately, and then I thought if I did start and I started depending on it again, and then it quit, I might be out of position; so I discontinued the airstart effort and concentrated on making the runway.*

By that time my chase, Captain Bud Evans, was with me. I extended the Ram Air Turbine (RAT), and I could hear him assuring the test ops guys that I was doing OK, but I couldn't hear them. I dove at a point about a mile out from the lakebed at about 300 knots, flared out for a shallow approach, dropped the gear when I was below the limit speed, and glided into the landing. Some of the blades in the engine had rubbed on the shroud, the shroud shrunk a little with the sudden gush of cold air at 40,000 feet, and the engine had frozen up by the time I stopped."

"There was a mild flap in the Pentagon because some armchair jockey concluded that the engine couldn't be airstarted. We hadn't done the airstart program at that point so he was making an assumption that was not justified. When you're faced with a situation like that—lakebed full of water—flying the company's stock in a high level competition—faced with an emergency landing, it isn't the time to think about the 'politics' of the situation. The name of the game is GET THE AIRPLANE SAFELY ON THE GROUND—and then worry about what happened, explaining the logic of your reasoning."

The Director of Flight Test, Colonel Horace A. Hanes (later to become Major General) said, "Such an incident could have ended with catastrophic results. However, there was not a scratch on the aircraft, not even a blown tire. It was a magnificent tribute to Al's skill and to the inherent safety engineering of the aircraft."

The postflight examination revealed the cockpit total fuel indicator showing a total of 560 pounds remaining, with 587.75 pounds actually remaining. Engine runs were made with no apparent engine malfunction or damage. The only damage done to the aircraft was one bent RAT blade. It apparently had hit the RAT door lock during extension. And, of course, the engine had to be inspected. The cause was finally traced to an ALCS pressure plug left in the fuel system. It apparently had been dropped in, by accident, some time during maintenance and was never missed.

Additional LABS practice releases were made during the seventeenth flight on February 1, 1957; all were flown without difficulties. On February 4, 1957 during the nineteenth flight, a V_{max} drop was again attempted, when the ALCS decided to act up. The flight was not wasted, for on the way back the refueling boom was extended at 260 KIAS and 290 KIAS. It worked extremely well, with only about ⅛ ball of yaw in each case. The high speed limits (remember this took place in mid-1950s) of the refueling probe allowed the F-107A to refuel from the tanker or buddy-aircraft at speeds much faster than most aircraft.

The Air Force pilots got their first taste of LABS in the F-107A when Captain Ellis, of the Air Proving Ground Center (APGC) at Eglin AFB, took 55-5119 up on its twentieth flight. His 55-minute pilot checkout flight mainly consisted of dives and LABS maneuvers. It was his belief that the F-107A could perform this maneuver with ease. The aircraft could perform the Tactical Air Command (TAC) mission.

This program, like all of the F-107A test programs, was very active. For example, three flights were made on February 25, 1957. The morning flight, the twenty-fourth for 55-5119, called for a high-speed centerline store drop. Al White dropped the store at a speed of 1.87 Mach number from 35,000 feet. It was a clean separation.

At last the NACA report was proven wrong!



NAA Photo via Gene Boswell

The TX-28 store and the rarely seen wing drop tanks installed. These tanks carried cameras to record weapon separation characteristics.

Major Gus Sonnenberg of APGC flew the afternoon flight, Flight No. 25, performing 600 KIAS entry LABS maneuvers. The F-107A again displayed positive control through the near supersonic speed maneuvers. The last flight of the day was the first night flight of the program. It was also flown by Al White. Three flights in one day, all in the same aircraft, all with no malfunctions.

TAC pilot Lieutenant Colonel Bob Scott flew Flight No. 28, performing a large range of tests. During the 50-minute flight, he performed both LABS and Dive runs at high and low speeds, formation flying and low speed flight. His comments were very favorable. It was the conclusion of the APGC, that the airplane was an excellent aircraft for the LABS maneuvers and meets or exceeds all of the requirements set forth by TAC.

In fact, the aircraft was so good the Air Defense Command (ADC) expressed interest in a fighter version on March 8, 1957—the F-107B. This version would have replaced the four M-39 guns with snap-out-rocket pods similar to the F-86D/L and the proposed F-100 Interceptor. A formal proposal was written but nothing ever came of it. As a side note, the author's F-86F, serial number 52-5143, registration number N25143, was modified to flight test such a system.



Illustration from the William J. Simone Collection

Artist conceptual representation of the F-107B as an air defense fighter interceptor.

On March 20, 1957 a new store test program was approved. This series of tests was for the "Sandia" thermonuclear weapon. This weapon was being considered to be carried on the production F-107A. The characteristics of the Sandia shape still remain classified.

This program called for the F-107A to takeoff from Palmdale, fly to Barstow at Mil Power to 30,000 feet then go into afterburner to 35,000 feet, where a turn was made over Barstow towards the Salton Sea, 85 nautical miles away. This leg was to be flown at 35,000 feet at a speed of Mach 2. The special store was then dropped from a level flight attitude, 16 nautical miles from the impact point, at Mach 2 and a 2g turn was made pointing the aircraft back towards Palmdale, 130 nautical miles away.



Photo from the William J. Simone Collection

The Sandia shaped store being tested using Aircraft S/N 55-5119.

J.O. Roberts was assigned as the NAA project pilot with Captain Jim Carson (the Phase II AF Project Pilot) as the AF pilot. The short program called for seven flights, the first being flown by Capt. Carson on June 4, 1957. In all, the program lasted just over 8 weeks, the last drop occurring on August 5, 1957 with J.O. Roberts at the controls.

Store separation tests were now complete. A total of seven separation drops were conducted, five TX-28 shapes and two Sandia shapes. All had been successfully separated at speeds up to and including Mach 2. This was a first for fighter aircraft, in fact, a first for any aircraft. Strategic Air Command's (SAC) new Mach 2 bomber, the B-58, would not accomplish such a task until February 10, 1961, and it 'experienced anomalies', requiring several additional tests before the B-58 was cleared to drop its centerline store at its design speed of Mach 2. Meanwhile, the F-107's competitor, the F-105, was experiencing problems of it own with it's weapon bay. When the weapon bay doors were opened to the supersonic air stream very strong unsteady flow entered the weapon bay causing major separation problems.

About the Author: Bill has an extensive background in flight test and is currently an engineer at the Lockheed Martin Skunk Works. He is a dedicated enthusiast of the F-107A and has authored a very detailed book about the F-107A. Bill currently resides in Lancaster, California.

Pratt & Whitney Rocketdyne J-2X Engine To Power CLV Upper Stage

Pratt & Whitney Rocketdyne, a unit of United Technologies Corporation, has been selected to provide a new version of the Apollo-era J-2 engine as a propulsion system for the Crew Launch Vehicle (CLV) upper stage.

Uprated in power and designated the J-2X, the hydrogen/ oxygen fueled engine will be rated for human flight. The first manned launch of the J-2X powered CLV is planned for 2012.

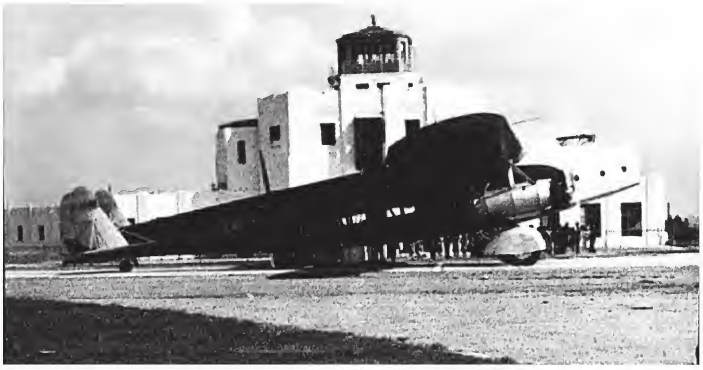
The NASA decision to select this engine was based on the J-2's performance history as part of the Apollo program and on the fact that an engine in this thrust class could be used for the CLV upper stage and, in the future, to power the Earth Departure Stage (EDS) for lunar missions.

Contrails From The Past

by Ed Rusinek

Dear Ed,

The Summer Issue arrived yesterday and I really enjoyed reading "The Early Days" by John Young. The article stirred up some old memories and I felt moved to share them with you. The photo of the Fokker F-32 rang the bell, since they flew regularly almost directly over our new house in Monterey Park when taking off from the Western Air Express terminal in Alhambra, about 1½ miles East by North. I am enclosing some prints including a photo of an F-32 which I took in 1930 with a box camera.



A Western Air Express F-32 at Alhambra Airport on Valley Boulevard in 1930.



The Alhambra Airport in 1932 with the unique hexagon hangar seen in the northwest corner of the airport.



An unusual single-engined airliner with fully-retractable landing gear at the 1934 Air Races held at Mines Field.

In 1936, with less than 2 years of aero engineering training at Pasadena Junior College, I applied to Douglas Aircraft in Santa Monica for a job. I was hired to lay out master templates for the new DC-3 Mainliner which had just come off the boards. I also laid out templates for the DC-4 and the DF-151 flying boat for Russia. Your article mentioned the small sized contracts that were awarded at that time. In 1937, Donald Douglas called an outdoor meeting of all employees to announce that the company had just won a big contract for three DC-3s from Dutch KLM Airlines!

At lunchtime, while eating at a local hashhouse, some NAA employees tried to get me to quit Douglas and come to NAA. Many years later, after working at Douglas, Vultee, Lockheed and Convair, I finally joined NAA Space Division in June 1951. The NAA work involved the Navaho, Hounddog, F-15 proposal, Saturn II Booster, B-1 and the Space Shuttle. Very interesting problems to solve, and no boring moments—I consider myself to be very fortunate in my life's work.

—Douglas Alkire, Monterey Park, CA

Ed's Ans: Thanks for the memories, Doug! The beautiful single engine airliner in your photo is a Vultee V-1A, built at the Aircraft Development Corporation factory located at Grand Central Airport in Glendale. American Airlines bought eleven V-1As but the government decree that single engine transport were not allowed halted that sale. Eventually, several V-1As ended up in the Spanish Civil War as bombers.

Dear Ed,

I was saddened to read about the passing of Al White. He tested many of the aircraft I was responsible for while working as an NAA Engineering Flight Test engineer at EAFB. You omitted the F-107A in your list of the airplanes he flew. This airplane had many new features including a variable area inlet duct, spoilers, no ailerons, an all-moveable horizontal tail and an electronic flight control system called Alice.

—Donald "Sam" Richter, Redding, CA

Ed's Ans: We stated in his obit that Al flew every NAA airplane except the X-15 and that included the F-107A. He was an exceptional pilot, an outstanding engineer and a modest author. He favored the bulletin with several wonderful articles which we were proud to publish.

CONGRATULATIONS
and BEST WISHES to
Hank and Roberta Hankins
of Long Beach, California
Celebrating Their
62nd Wedding Anniversary

The Silent Majority

by Stan Guzy



BRADY, CHARLES E. JR., M.D., CAPT., 54 – died in the woods on Orcas Island off the coast of Bellingham, WA. Charles was an Eagle Scout, athlete, doctor, a Blue Angel, and an astronaut. After receiving his medical degree from Duke University, he worked in sports medicine before joining the U.S. Navy. Trained as a flight surgeon, he served aboard the aircraft carrier *USS Ranger*. He later joined the U.S. Navy Flight Demonstration Squadron, the *"Blue Angels"*. In 1992, he reported to NASA to become an astronaut. His crew aboard the Space Shuttle *Columbia* established an endurance record during STS-78 of 271 earth orbits in 405 hours. He later was the Deputy Director for astronaut training and returned to Navy duty as a surgeon.

BAILEY, BETTIE LOU, 79 – died June 2, 2006 from natural causes. She was a long time employee at the Autonetics Financial function prior to retirement.

BALDWIN, L. GRANT, 79 – died July 25, 2006 of prostate complications at his home in Newport Beach, CA. He worked at NAA/RI in Human Resources, specializing in labor relations, arbitration and negotiations at the Division level. He left NAA/RI in 1968 to pursue a different career. Grant was a member of the Bald Eagles. His wife Josephine survives him.

BALDWIN, ROBERT C., 87 – passed away on July 15, 2006 in Riverside, CA of undisclosed causes. He had a successful career as an aerospace engineer working for NAA/RI on the Apollo program prior to retirement. He is survived by his caring wife Sybil.

BARRERA, FRANCISCO "FRANK", 71 – passed away on May 8, 2006 after complications from surgery just 21 days after his wife Teresa succumbed to ovarian cancer. They had been married 51 years. Frank retired from the Planning and Control function at the Marine Systems Division in Anaheim in 1989.

BARRY, PAULINE I., – Pauline passed away in Tucson, AZ on March 15, 2003 after a brief illness. She retired from Autonetics in 1996 after 25 years of service. Her daughter Joleen notified us of her death.

BERENDZEN, ROY D., 81 – of Rancho Palos Verdes, CA died on May 26, 2006 of cancer. Roy worked as an engineer and retired from the Sabreliner in 1981 after 31 years of service. He is survived by his loving wife Fran.

BOHRER, SAMUEL, 84 – died peacefully on July 12, 2006 with loved ones at his side at his home in Mission Viejo, CA. An engineer for over 30 years, Sam played an integral part in the research and development of the Apollo and Space Shuttle programs at NAA/RI. Past president of NAA Space Division, Dale Meyers, said of him,"He was one of the great team players we had in the old days of North American Aviation." He is survived by his wife of 56 years, Gloria.

BRIGHTMAN, BRUCE, – passed away on June 14, 2006 in Long Beach, CA after an intense battle with cancer. He worked at the NAA/RI Seal Beach facility primarily in the GPS Materiel function prior to his retirement in 1990. Commendably he volunteered his time in gathering food for needy families. Bruce is survived by his wife of 52 years, Bette.

BUDNEY, GEORGE, 85 – died May 21, 2006 after a short illness. After earning an advanced engineering degree from Columbia University he worked at the Atomics International Division of NAA/RI as a Project Manager on commercial and aerospace nuclear power plant projects, and later on, geothermal power and industrial heating projects. Rose, his wife of 50 years, survives him.

CARTER, GERALD D., 79 – died on June 6, 2006 of pneumonia. He was a retired electrical engineer from NAA/RI. His wife Claire survives him.

CARTER, LARRY N., 69 – died of Lou Gehrig's disease on May 5, 2006 in La Quinta, CA. He had retired in 1998 after 38 years of service as an electrical engineer. Larry was quite active in playing and giving tennis instructions. He is survived by his companion of 17 years, Judy Chandler.

CUTTER, JAMES "JOCKO", 77 – died at his home in Paso Robles, CA on June 30, 2006 of lung cancer. "Jocko" retired from Space Division in 1990 after 31 years of service in the project office. He is survived by his caring wife Geraldine.

DOYLE, VINCENT A., 89 – died on May 17, 2006 in Saint Paul, MN. During WWII, Vince served as a navigator/bombardier with the 341st Bomb Group of the 14th Air Force in China. He joined NAA and served on various programs at LAD and Oceanside. He left NAA/Rockwell in 1984 after 15 years of service to work as a civil engineer for Los Angeles County and the City of Oceanside, CA. He is survived by his wife of 63 years, Mary.

EDWARDS, PAUL R., 76 – Paul was at home in Seal Beach, CA with family and friends when he lost his battle with cancer on August 7, 2006. He joined NAA in 1952 as an engineer and worked on many NAA aircraft, and later, on the Apollo, Space Shuttle, Space Station and GPS programs. His specialties included aerodynamics and propulsion systems. Paul retired in 1990 with 47 years of service. An avid sailor, Paul owned many sailboats and held an interest in a power boat. He is survived by his loving wife Lara. Good Winds, Good Sail, God Speed, Paul.

GOFF, HERBERT R., 82 – passed away peacefully in Santa Cruz, CA from undisclosed causes. He had been employed by NAA/RI as an electrical engineer and his career spanned over 35 years. His extended family survives him.

JONES, SID, – passed away on July 14, 2006 after a long illness complicated by the onset of Alzheimer's disease. Sid had worked initially for NASA serving as the technical interface with NAA/RI on the Apollo and Shuttle programs. After retiring from NASA, he spent several productive years at RI before retiring again. He moved to a beach home south of Kemah, Texas.

LEWIS, HARMON Z., 89 – passed away June 22, 2006 from undisclosed causes in La Mirada, CA. He came to California in 1941 and was employed by NAA for 34 years until he retired. His wife Essie survives him.

LOGELIN, EUGENE G., 78 – died in Hemet, CA on May 6, 2006. Gene served at Autonetics for 30 years when he retired as a manager. He is survived by his wife Betty.

LOOP, RICHARD "DICK", – passed away at his son's home

in Perris, CA after a long illness. Although suffering with illness, Dick found the strength to square dance with his wife in past years. He served in Navigation Systems for 35 years prior to his retirement in 1988. He is survived by his wife of 57 years, Micky.

MARSHALL, RICHARD L., 77 – of Leisure World in Seal Beach, CA passed away on June 15, 2006. Richard retired from LAD in 1989 after serving for 40 years as a tool and die maker and UAW Union President. He is survived by his wife Daphne.

McGINNIS, LEON C. "MAC", 87 – of Torrance, CA passed away on December 9, 2005 due to complications of diabetes. A veteran of both the Army and Air Force, Mac was an NAA Tech Rep serving in the field, including a stint with the 450th Fighter Day Wing awaiting the arrival of the new F-100C at Foster AFB in Victoria, TX. He was buried at the National Cemetery in Riverside, CA and is survived by his wife of 53 years, Betty.

MEYER, HENDRIKUS "HANK" JR., 79 – died of myocardialinfarction at the Suburban Medical Center in Paramount, CA on July 4, 2006. Hank worked as an electronics warfare engineer at NAA/Rockwell/ Boeing. Hank received the Engineer of the Year award for his work on the Sabre Cross Flight Test Program. He was an avid ham radio buff, an accomplished ballroom dancer and a professional musician. He is survived by his wife Jolee.

MILLER, CHESTER R. JR., 84 – of Hemet, CA, passed away on June 21, 2006. Chester started at LAD as a machinist in 1942 and retired as a manufacturing engineer after 45 years of service.

MORMANN, NORBERT B., 83 – died of cancer on July 10, 2006 in Fort Walton Beach, FL. After serving in the Army Air Corps, Norbert joined NAA as an aircraft mechanic in the Engineering Flight Test group at Edwards AFB and the Palmdale Facility. He retired from Space Division in 1987 after 25 years of service.

PATTERSON, BARBARA, 75 – passed away at her home in Redding, CA on May 24, 2006 after a long illness. She had worked at NAA/RI Space Division for many years in the Contracts & Pricing function of Finance prior to her retirement.

PICKRELL, DON H. JR., 82 – died on July 11, 2006 in Yorba Linda, CA after a determined battle with various health issues. After receiving his PhD at the Cal Tech, Don started at North American Aviation Autonetics which followed to Rockwell International. He rose to the position of Executive Vice President and General Manager, Marine Systems Division. In the final years, he was designated to help launch the Company's "Star Wars" program, and retired General Manager of the Strategic Defense and Electro-Optical Sensors Division. After retirement, he served as both Chairman and member of the Board of Directors of the RI Federal Credit Union. His wife Mary Ellen survives him.

PIRZYNSKI, JOSEPH, 89 – passed away on April 18, 2006 in Inglewood, CA. Joe retired in 1981 after many years of service.

RANKIN, ARVADA E. "VADE", 81 – passed away on June 1, 2006 surrounded by his loving family, having celebrated one day earlier his 60th wedding anniversary with his wife Marjorie. He had worked and retired as a Test Engineer from RI.

REED, CALVIN "CAL", 82 – died June 17, 2006 in Escondido, CA. Cal was a film and video director and was nominated for an Oscar for his documentary film, *"With Their Eyes on the Stars"*. He retired from Rockwell in 1975 and is survived by his wife Dene.

RESECK, LEONARD F., 86 – died of natural causes in Downey, CA on May 2, 2006. Leonard was a facilities and industrial engineer at Autonetics. He was responsible for the microelectronics processing labs in Anaheim and the establishment of Irvine Electronics. He served three terms as president of the Vintage Chevrolet Club and was proud of his own 17 vintage Chevrolets. He is survived by his wife of 66 years, Lorena.

SCHWARTZ, ARNOLD F. "SHORTY", 95 – passed away peacefully in his sleep in Lodi, CA. He started in the Shipping Department at LAD in 1937 and retired as a supervisor after 36 years of service in 1973. After retiring, he moved to a small ranch he owned east of Lodi, CA and finally settled there. He is survived by his loving wife of 58 years, June.

SMITH, JOHN C. "JACK", 90 – passed away of cancer in Stockton, CA on May 10, 2006. Jack left NAA in 1960, having served 19 years in the F-86/F-100 Flight Inspection group. He is survived by his loving wife of 53 years, Nadine. She was also an NAA employee, serving at the NAA Nurse's Station in Fresno, CA.

STAGNARO, VINCENT J., 66 – passed away on June 11, 2006 from undisclosed causes in Reno, Nevada. After retiring from the Navy, Vince earned a BS degree and began a second career in 1961 as a Senior Pricing Analyst at the Autonetics Division. Vince retired from NAA/RI/Boeing in 2002. His wife Judy survives him.

TAUBE, LEROY J. "LEE", 76 – of Costa Mesa, CA passed away on May 20, 2006 from undetermined causes. His wife and family were at his bedside. Lee began his career with Boeing, moved to Collins Radio and ended his 32 years of service with NAA/RI. At retirement he was Director of Contracts and Pricing, having worked on the Apollo, Space Shuttle and Space Station projects. He had received two NASA Astronaut Snoopy Awards. He is survived by his loving wife Lois.

YAMANE, EDWARD M., 81 – died in Pasadena, CA on January 16, 2006 of cancer. Ed was born in Papaaloa, HI. Shortly after the attack on Pearl Harbor, Ed volunteered for the famed all-Nisei 442nd Regimental Combat Team. His unit faced horrific German opposition and he was wounded twice in Italy and in Germany. After the war, Ed received his engineering degree from the University of Kansas and joined NAA at LAD. He worked on Ground Support Equipment for the WS-110, which later was designated the XB-70. He subsequently became supervisor of the AGE Group for the B-1. Ed was buried at the National Cemetery in Hawaii with full military honors. His loving wife Yasue survives him.

YOUNG, FRED E., 81 – passed away of a heart related problem on April 3, 2006 in Poland, OH. Fred retired from the machine shop at Space Division in 1986 after 26 years of service.

LOST SHEEP – BULLETIN RETURNED WITH NO FORWARDING ADDRESS
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North American Aviation Retirees Bulletin

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NASA Photo

On July 17, 2006, the STS-121 crew of Space Shuttle **Discovery** *returned safely to NASA's Kennedy Space Center after performing a near-flawless 13-day mission to the International Space Station. The crew of STS-121 included Mission Specialists Mike Fossum and Lisa Nowak, Commander Steven Lindsey, Mission Specialist Stephanie Wilson, Pilot Mark Kelly, and Mission Specialist Piers Sellers. Mission Specialist Thomas Reiter of the European Space Agency (ESA), the seventh member of STS-121, remained on board the International Space Station working with the Space Station crew under a contract with the ESA and the Russian Federal Space Agency.*

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION
Retirees Bulletin

Winter 2006



Wishing You a Holiday Season filled with Peace and Joy



Inside: **THE FUTURE COMBAT SYSTEMS** by John Peller

NORTH AMERICAN AVIATION—A LEGACY OF LEADERSHIP by Jim Albaugh

THE B-17 PIGGYBACK STORY by Ralph Kenney Bennett



Photo from the Erik Simonsen Collection

In 1935, seventy-five families packed their belongings in their cars, received $50 for expenses and set out in a caravan from Dundalk, Maryland to Inglewood, California—a distance of over 2,700 miles, much of it on dusty dirt roads. They did it all on a promise by Dutch Kindleberger that once they got to California they would build airplanes. Along the way, they stopped at the Grand Canyon. These were the original "Bald Eagles" and the wonderful wives that made that spirited journey with them.

NORTH AMERICAN AVIATION
Retirees Bulletin

NAAR BULLETIN, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/ Rockwell/Boeing.

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DEAR NAA RETIREE BULLETIN SUBSCRIBER

With this final issue of the year, we have published the bulletin quarterly for over six years without any financial support from any other entity than you, our readers and subscribers. We started out with a printout from Boeing of the names and addresses of the 9,300 NAA retirees that received the bulletin as a "freebie" when the company paid all the costs. Thanks to a few contributors, we managed to print and mail out the first bulletin to those retirees for free, asking them to subscribe. A third of you responded with your checks and your best wishes. Thanks to your support, the bulletin today stands on solid ground. We believe that the reason that so many of you have continued to resubscribe is the quality of our articles. We have been blessed in having some great writers accept our invitation to provide articles. We also have the good fortune to have historians Mike Lombardi at Boeing Seattle and Dr. Raymond Puffer at Edwards Air Force Base provide us accompanying photos which enhance our stories. To all, we say thank you and God Bless!

In this issue, we provide something old, something new and a look back at World War II. The new is an article by Dr. John Peller about a new project at Boeing being completed by many of the old North American-Rockwell employees still active and working on a future weapons system for the Army. This information is so new and current that it had to be cleared through the Army. The old is an article by a still very active and defining North American-Rockwell employee, Jim Albaugh, the President and CEO of Integrated Defense Systems at the Boeing Company. In this Christmas season when our nation is at war and yet we have so much to be grateful for, we have selected a grim moment during World War II when a group of Americans, faced with death, brought out the best that defines us as Americans. The story has nothing to do with North American Aviation but everything to do with the price we must be always ready to pay to maintain our freedoms.

If your subscription ends with this issue, please renew soon and save us a lot of paperwork! Just send a check made out to "Bald Eagles, Inc." and note on the check "2007 Renewal". Thank you!

The 45th Bald Eagles Reunion Will Be Held
on Saturday, April 14, 2007
at the Proud Bird Restaurant
11022 Aviation Blvd. (at 111th Street)
Doors Open for Social at 10:00 AM
Seating for Lunch at 12:00 Noon

Send your check for $20.00 payable to Bald Eagles Inc. to:

Val Yarbrough (805) 646-2283
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Include with your check the name you wish on your badge and the name of each guest included in your payment. Tickets and badges will be issued as you register at the door.
Preferred seating is limited so order your tickets early. Tickets will be sold at the door. Sorry, no refunds after March 26, 2007.

There are no service requirements to attend – just the love for Airplanes and Spaceships—Meet old friends—Make new ones!
Parking is limited—Carpooling and early arrival is encouraged!

NAA/ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club members have joined the UAW retirees, meeting at the UAW Regional Hall at 6508 S. Rosemead Blvd. in Pico Rivera, CA on the 4th Wednesday of each month at 11:00 AM. Contact Frank Zelinski at (562) 866-3195 for more information.

The Antelope Valley Retirees Club meets in the South Meeting Room of the Palmdale Culture Center at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell/Boeing retirees are welcome.

Valley Aerospace Retirees Club meets on the 3rd Thursday of each month at the Pratt & Whitney Rocketdyne Fitness Center at 8500 Fallbrook Avenue, Canoga Park, CA. The president is Dennis Larson at (818) 340-6031.

Boeing Retirees Breakfast Club meets on the 1st Wednesday of each month at 8:00 AM for breakfast at IHOP Restaurant, corner Fallbrook and Vanowen in West Hills. Contact Howard Seese at (818) 344-7861.

"The Old LAD Stress Group" meets for breakfast approximately every two months at Mimi's Café in Torrance, CA. If you are from the old LAD Stress Group contact Gene Laxton at (310) 378-3113 or Ed Rosenthal at (310) 375-8933.

"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meet at 11:30 AM on the 2nd Wednesday of the month for lunch at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd. and Mariposa Ave.

The NAA 101 Tooling Retirees Group meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at Billy's Restaurant, 5160 190th St., west of Anza Avenue in Torrance, CA.

GPS Breakfast Club meets from 7:00 AM to 8:00 AM every Wednesday at the new Primrose Restaurant, Leisure World Shopping Center at Seal Beach Blvd. and Westminster Blvd. All are welcome! For more information, call Fred Shitara at (714) 746-4426.

Seal Beach Retirees Group meets at 11:30 AM on the 3rd Wednesday of the month at "The Fish Co." on Los Alamitos Blvd. at Katella Avenue. For more information call Marvin Blaski at (714) 848-5717 or e-mail to *mblaski@aol.com*.

The Facilities, Industrial Engineering and Plant Services Retirees Group meets at 11:45 AM on the 2nd Thursday of each month at Buster's (formerly Jolly Roger's) Restaurant in the Long Beach Marina. Contact Joe W. Mausser at (562) 596-5845.

"Ye Olde Pharts Breakfast Club" meets at 10:00 AM on the 4th Thursday each month for breakfast at Polly's Pies at 2025 N. Tustin Avenue in Orange. For information call Frank Luis at (714) 639-0990.

The North American Rockwell Retiree Club of McAlester, OK (a satellite of Tulsa, OK) meets at 10:30 AM on the 3rd Tuesday in March, June, September and December at the Down Town Meeting Place. Call J.A. Darden at (918) 423-0706 for more information.

Tulsa & McAlester Retirees meet for breakfast at 8:00 AM on the 2nd Monday in March, June, September and December at the Ramada Inn, 8181 East Skelly Drive in Tulsa, OK. Call Harry Phillips at (918) 838-3716.

The North American Rockwell Retirees Group of Columbus, OH Engineers and Professionals meet at 11:30 AM on the 3rd Thursday of each month at the Berwick Park House. Contact Byron C. Solomides at (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH meets at Noon on the 1st Monday of the month at the Whitehall Community Park on North Hamilton Road in Whitehall. Contact E. Hamilton at (740) 927-5940 for information.

Autonetics Group including Marine Systems, Program Office, Project Office, System Test, Engineers and Designers meets for lunch on the last Wednesday of each month at the HomeTown Buffet, Rose Ave. and Alta Vista Dr. in Placentia, CA. Call Mike Vohs at (714) 762-1925 for more details.

Autonetics Industrial Engineering and Maintenance Retirees meet for lunch on the 1st Thursday of each month at the HomeTown Buffet, 390 McKinley, located in front of the Home Depot, in Corona, CA. For more details, call Don Burk at (909) 698-0072.

Autonetics Retirees meet for lunch at 11:45 AM on the 2nd Wednesday of every month at the Rembrandt Restaurant or Yorba Linda Country Club. All Autonetics retirees, spouses and friends are invited. Contact Robert Nease at (714) 516-1844 or e-mail to *rfnease@email.msn.com* or Ed Venanzi at (714) 779-5652 or e-mail to *Ed-LindaVenanzi@adelphia.net*.

A Group of NAA Retirees meets for breakfast at 8:15 AM on the 1st Wednesday of each month at Knott's Berry Farm-Chicken Restaurant. All are cordially invited. Contact Maxine Haun at *maxi3131@sbcglobal.net*.

Autonetics Financial Luncheon Group meets for lunch at Noon on the last Wednesday of the month at Marie Callendars, 126 East Yorba Linda Boulevard in Placentia. Contact Ken Cantwell at (714) 970-7171 or e-mail *Kcantwell@adelphia.net*.

A Group of Engineering Mgt. meets at 11:30 AM on the 3rd Tuesday of the month for lunch at Denny's on Imperial Hwy. and the 57 Fwy. in Brea. Call Earl England at (714) 528-0614 for information.

NAA Tech Reps Assn. (TRA) Breakfast Club meets at 9:00 AM on the 1st Tuesday of each month at the Carlsbad Airport Restaurant. For more information, call El Presidente Rafael Colunga at (760) 940-0525.

Material Group Retirees from Downey and Seal Beach meet at 11:30 AM on the 4th Wednesday of every month at the Stox Restaurant at Imperial Hwy. and Bellflower Blvd. in Downey. Contact Marian Nielson at (562) 429-1020 or Joan Dominguez at (562) 865-7200.

NAA/Rockwell Vandenberg AFB Retirees Breakfast Club meets at 8:45 AM on the 2nd Thursday of each even month at the Bakers Square Restaurant at 1841 S. Broadway in Santa Maria. Contact Marv Bailey at (805) 929-6552, Al Finlay at (805) 937-3690 or Bob Broggie at (805) 937-4674.

KSC Rockwell KMA Club meets on the 2nd Thursday of each month for lunch at the Florida Seafood Restaurant in Cocoa Beach. Contact Jerry Pruitt at (321) 636-9417 for details.

The Hangar Gang meets at the Proud Bird approximately every 4 months. For time, date and other details, call Gene Salvay at (818) 788-3974 or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

ANNUAL EVENT

Bald Eagles 45th Annual Reunion will be held on Saturday, April 14, 2007 at the Proud Bird Restaurant. Call Val Yarbrough at (805) 646-2283.

Flight Test Instrumentation Annual Reunion – This group of retirees meets annually at the Fullerton Elks Club. For information, call Frank Vigil at (562) 691-0236.

Tech Rep Association Picnic – A group of retired Field Service Technical Representatives has a yearly picnic in June at a park in Fallbrook, CA. For more information, call TRA President Rafael Colunga at (760) 940-0525 or e-mail to *rafael2@peoplepc.com*.

The Annual M&P, P.D.L., "Friends Christmas Luncheon" – This group assembles in mid-December for a festive luncheon. Those wishing to participate and receive notice of the next December luncheon, call Fred Koeller at (310) 545-8854.

Information Systems Center Annual Reunion will be held Tuesday, May 15, 2007 at Khoury's Restaurant in Long Beach Marina at 4:30 PM. Contact Nelson Slagle at (714) 514-9139 or *neslagle@hotmail.com*.

The Future Combat Systems

by Dr. John B. Peller, Ph.D.

Several articles in previous issues of this bulletin have described some of the earliest programs of NAA. This article will provide a "bookend" to these previous articles by describing one of the newest programs which many NAA veterans are still working on.

To put things in perspective, NAA's earliest attention was exclusively dedicated to airplanes. But by the early 1950s, NAA began to evolve into other fields that required similar capabilities: missiles, rocket engines, avionics, etc. An earlier article by this same author described one of the climax programs near the end of that evolution: the Space Shuttle, which was a Mach 25 airplane, a rocket and a spacecraft, all rolled into one. This clearly tapped a wide spectrum of talents within the evolving NAA.

Now the NAA veterans that are still working are mostly working with compatriots from Boeing and McDonnell Douglas, but their talents continue to show through. This article will describe one of the largest programs being addressed by these descendants of the NAA alumni and the aerospace workers we joined when we became a part of Boeing, along with McDonnell Douglas employees. The program is the Future Combat Systems program.

At first glance, the Future Combat Systems (FCS) is very different from what NAA veterans would expect us to be involved in. It's an Army program, not an Air Force program or a Navy Air program or a NASA program. It has some airplanes, but nothing like we're used to building, and we don't actually build any of the aircraft that go into FCS. It's also very large: the current contract value is over $17 billion (yes, that's a "b"), and that number doesn't include any production beyond initial prototypes for test and evaluation.

So what is this FCS program, and what do we do on it?

The FCS Program was born out of an Army desire to upgrade its fleet capability, moving away from vehicle systems that were optimized to counter the massive Soviet forces of yesterday's Cold War to vehicle systems that were optimized to meet the anticipated threats of today and tomorrow. The Army also wanted to transform the way they operate to take advantage of what new technologies have made possible.

The threats of today are generally smaller than the massive Soviet forces, but they strike quickly in remote areas of the world, use tactics (including terrorism) much different from the conventional warfare of the past, and adapt quickly to our tactics and capabilities.

While our performance in the first Iraqi war was superb, it required months and months to get our forces into position to start the war, and we are unlikely to have that much time in the future. So, one of the driving requirements of the new Future Combat Systems was to be able to get meaningful forces into any theater quickly and be able to quickly bring the battle to the enemy. This meant that everything had to be much lighter and smaller than before—light and small enough to be transported on the C-130 into remote battle areas. While the Abrams tank is a superb fighting machine, it weighs 70 tons. FCS platforms are limited to about one third of that weight.

Meeting that weight challenge (and the challenge of designing new ground vehicles that will fit into a C-130's internal cargo volume) is difficult, because the platforms still have to be both lethal and survivable.

The solution is a family of new vehicles, including eight different manned ground vehicles, three classes of unmanned ground vehicles, four classes of unmanned air vehicles, many unattended ground sensors, two kinds of unattended munitions, and the system to link all of these together into a highly effective fighting force. And last, but most important of all, is the soldier who is equipped and trained to use these capabilities to dominate any opposing forces.

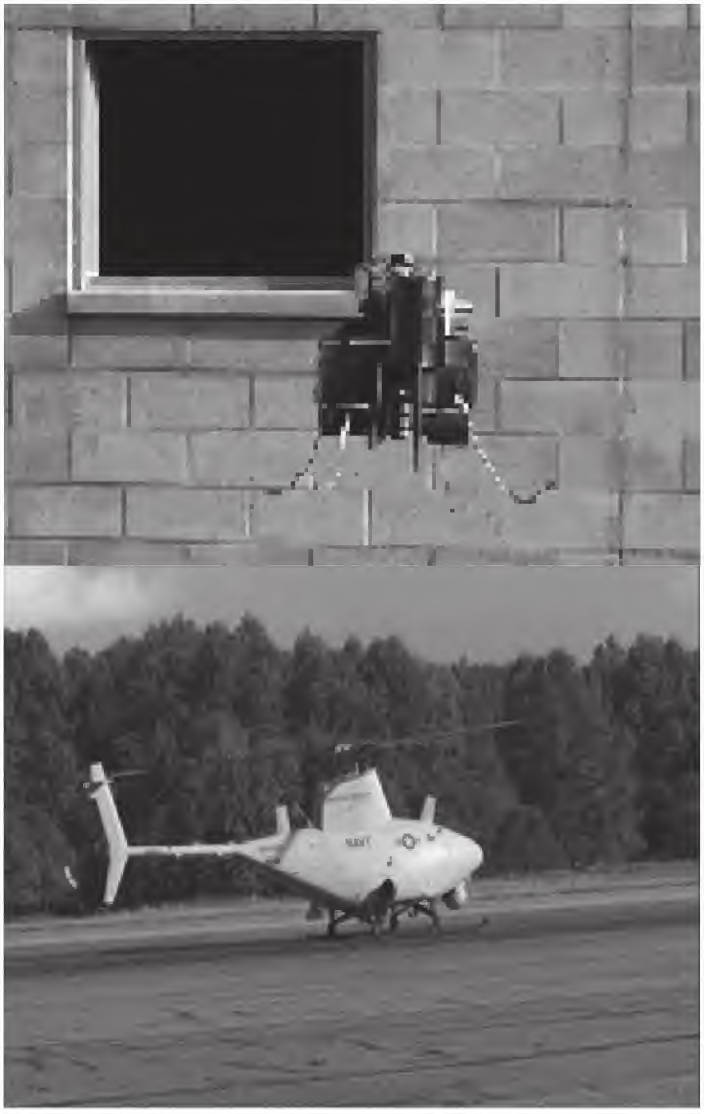
Boeing is the Lead System Integrator (LSI) contractor for this program. An LSI contractor is like a prime contractor, but doesn't build most of the parts. Instead, we seek the best members of industry for each element of FCS and contract them to put their best people and capabilities to work. We then integrate all of these elements into the overall FCS.

The system that links all of these elements together is a network, much like a private Internet. All elements of the system are linked together by this network (actually a collection of networks that form as required to link various groups within the overall system). All available data from hundreds of sources are brought together and used to create a single picture of what is going on, both with enemy forces and with our forces. This information is shared with all personnel as needed. This gives our forces a tremendous operational advantage over any opposing forces. While the fog of war will never go away, this information allows our forces to act with very little fog compared to that with which the enemy must contend. In tests to date and in various wargames, it has been shown how much power this gives our forces to dominate the enemy.

This network is the one element of the system that we do



The Eight Manned Ground Vehicles Being Developed on FCS



The Smallest and the Largest of the Four Classes of UAVs

ourselves. Called the C4ISR system (for Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance), it is the element that enables the new, much lighter and more agile platforms to maintain the lethality and survivability of the old heavy armor of the past. It is also the element that will integrate all of these platforms and elements into the combined fighting force that will achieve overmatch against any opposing force without an equivalent capability.

The up-front systems engineering to determine the requirements on each element of this highly interactive collection of systems is performed by a team headquartered in St. Louis, but with participation of many sites across the country. The tasks of developing the C4ISR system and performing the subsequent integration are performed by teams headquartered in Huntington Beach, but also involve sub-teams across the country. Large laboratories have been established to bring together the parts of the C4ISR system and to subsequently integrate all elements of the Future Combat Systems. These laboratories are located in an old tube bending facility in Huntington Beach, now transformed into one of the most capable integration and test laboratories anywhere.

The job of developing the FCS is not just that of developing another platform or singular weapon system. The FCS basic unit is the brigade, a force of a few thousand soldiers and hundreds of platforms and sensors. As might be expected, the systems engineering job is itself an immense task. While the National Missile Defense System (now called the Ground-Based Midcourse Defense System) had only 3 top-level requirements for the system, FCS has over 500. By the time these have been decomposed into requirements for the individual elements that make up the system, we are talking tens of thousands of requirements. This is probably the largest and most complex systems engineering task ever undertaken. At the major review last year to assess how well that job had been done, our team scored a hundred percent.

We are now into the preliminary design phase, although many elements are actually considerably further along that one would expect for this stage of a program. After three years into this tremendously complex program, our team can take pride in the fact that the program is still on schedule and on cost. With 18 major systems being simultaneously developed, this is an accomplishment without parallel.

In the next couple of years, some of the early capabilities will be "spun out" into the existing forces, and further spin-outs will occur every couple of years thereafter. In 2014, the complete FCS will be ready for the first brigade.

Veterans of the old NAA may wonder how we ever got into this type of business. There are several things that led to this development. One, NAA evolved from being just a developer and manufacturer of airplanes to a developer and integrator of complex systems based on those platforms. AWACS is a good example of this, as are such challenging programs as Apollo and Space Shuttle. Two, many of these platforms grew in capability by the successive addition of more complex payloads and avionics which both furthered the development of our integration talents and made us proficient in the evolving technologies such as networks and information systems. These talents were made more complete by the addition of related talents when Boeing, McDonnell Douglas and Rockwell came together in 1996. When the Army embarked on their transformation activities, this integrated team possessed the skills needed to execute the FCS program, even though they had never executed a program quite like this one. On the other hand, neither had anyone else in industry, and both our natural qualifications and our specific plans for how to execute this program led the Army to choose the Boeing team.

In conclusion, the FCS program is a dramatic step forward from the type of programs we recall in our memories, but it is in fact a natural outcome of the evolution of the talents and capabilities that started with the original NAA, evolved greatly within NAA and continue to evolve as we enter the early stages of the 21st Century.

About the Author: Once again, Dr. Peller has provided us with a tremendous look, not back, but forward. He retired as a Vice President of Boeing after a 41-year career with Boeing and its predecessor organizations. He served on the Shuttle program for over 13 years, completing his Shuttle assignments as Vice President of Engineering for Space Division. He led the capture teams for the successful proposals on the National Missile Defense and the Army's Future Combat System. He continues to support Boeing in a consulting role. Dr. Peller resides in La Habra Heights, CA with his charming wife Pat.

North American Aviation – A Legacy of Leadership

by Jim Albaugh

Through the 20th Century there were four defining moments in the history of aerospace. Clearly, the Wright Brothers first-powered flight launched the century's rapid evolution of aviation. World War II—with a new aircraft developed every few months—set the standard of rapid movement of ideas from the drafting board to the factory to the skies. The jet age of the 1950s forever changed the way people come together. And the race for space altered for all times how we view our universe.

Parallel to these remarkable aviation and space achievements, leadership in our industry followed a similar evolutionary path as great leaders left an indelible imprint on innovation and the business of aerospace.

A precise definition of leadership may seem difficult. However, as I look at it, true leaders possess certain inherent values that guide them throughout their careers as well as inspire others. All of us are very fortunate in the fact that North American Aviation began under the guidance of such individuals. We indeed have a rich legacy of leaders that formed a fledgling airplane company and transformed it into greatness. And since it is a heritage that endures today at The Boeing Company, it is good that from time to time we remember these men and their contributions.

James Howard "Dutch" Kindelberger started out at the Glen L. Martin Company in Cleveland before moving to Douglas Aircraft in California, as vice president and chief engineer. In 1934, while immersed on the DC-1 and DC-2 airliner programs, an opportunity arose to head up North American Aviation (NAA), which was then part of General Aviation Corp. in Dundalk, Maryland. Dutch accepted the offer to become president of the Dundalk-based subsidiary, and wisely took along a few top engineers including Lee Atwood and Stan Smithson.

However, aviation sales moved slowly in the east, and Dutch decided to move NAA to Southern California to pursue new business and benefit from year-round good flying weather. It was 1935, and an automobile caravan moved the small NAA group cross-country to Inglewood, California, near Mines Field (now LAX). They were the hearts and brains of a new era of aviation. Today, the "Bald Eagles" organization represents the spirit and memory of this original group.

By January 1936, there were 159,000 square feet of floor space occupied by 150 employees at the new Inglewood plant. Soon, hundreds of BT-9 trainers and O-47 observation planes would be rolling out the door. In addition, the venerable NAA T-6 Texan for the Army Air Corps, and the Naval variant SNJ, went on to train more U.S. and Allied pilots than any other aircraft produced during WWII.

NAA plants at Los Angeles, Dallas and Kansas City ran under the leadership of Ralph Ruud, where critical mass production techniques were developed that set the standard for the industry. Ralph, one of the original "Bald Eagles", instrumental in developing contouring spar and skin mills to achieve tapers and contours, developed the "erector set" concept for tooling that permitted the use of demountable heads on a wide variety of parts and assemblies, and introduced machine riveting to the industry.



Photo from the Erik Simonsen Collection

In 1935, driving cross-country in a caravan of cars with no air conditioning and only the possessions they could carry, the NAA families made the harsh journey from Dundalk to Inglewood over dirt roads with the same spirit that built the very best airplanes and spaceships. Among them, taking a short break to stretch their legs, was a pensive Ralph Ruud in the pullover.

During the height of WWII, an airplane was produced at one of NAA's factories every 15 minutes. During 1945 alone, 1,200 aircraft per month were being produced at NAA facilities. Ralph's leadership helped NAA produce an astonishing 42,000 airplanes from 1940-45. This included the famed P-51 Mustang, which provided long range bomber escort, and was credited with nearly half of all enemy aircraft shot down over Europe. Almost 10,000 B-25 Mitchell medium bombers were also produced. Sixteen carrier-launched B-25Bs participated in the "Doolittle Raiders" first attack on the Japanese homeland. America had compiled impressive statistics across the industry that its enemies could not have predicted.

Mass production certainly was important, but innovation also took precedent at NAA. For example, the P-51 featured aeronautical design advances such as a laminar flow



Photo from the Erik Simonsen Collection

The B-25 production line in Kansas City expanded so quickly, final checkout had to be performed out on the tarmac.



Photo from the Erik Simonsen Collection

The flight line activity at the LAD facility during World War II never stopped. Notice the fourth P-51 in line with the RAF roundel insignia on the side of the fuselage.

airfoil section, and a unique underbelly air scoop that added "momentum" to the engine exhaust system. Such forward thinking did not go unnoticed by the military, industry, and potential adversaries.

Who would have dreamed that within a few decades NAA would be developing and building supersonic and hypersonic aircraft. The F-86 Sabre Jet – the first swept-wing jet fighter; the F-100 Super Sabre – the first operational supersonic fighter; the B-45 Tornado – the first multi-engine jet bomber for the Air Force; and soaring to new record setting heights of 70 miles in the rarefied atmosphere and at speeds up to Mach 6.7 (4,520 mph), the NAA designed rocket-powered X-15 took center stage.

After Dutch Kindelberger's retirement in 1960, Lee Atwood, who originally joined Dutch from Douglas Aircraft, became President and CEO. Subsequently, evolution had changed the company-from North American Aviation to North American Rockwell to Rockwell International and ultimately to Boeing.

An evolution yes, but the spirit was intact.

Then there was a bomber that cruised at Mach 3 plus at 75,000 feet, the XB-70 Valkyrie-and it still was only the 1960s. NAA had developed a revolutionary new processing technique to create a stainless steel honeycomb structure designed to withstand the high Mach generated 600-degree aircraft skin temperature. Powered by six General Electric YJ93-GE-3 engines, the 500,000 lb. bomber would literary ride on its own shock wave. For decades, historians have credited this aspect for the superb performance of the XB-70. However, as Lee Atwood quipped over four decades later, "Compression lift was definitely a factor, but definitely overplayed by so-called experts. It was the variable geometry inlet design that provided Mach 3 plus cruise." This meant that at the time, NAA had achieved remarkable progress in the propulsion area.

Deployment of such a potent, and most importantly flexible weapon system certainly would have sent the right message that might have impacted the duration of the Cold War. However, we will never know, as the B-70 was never deployed—but that's another story.

Under the leadership of Lee Atwood, a company that built airplanes that helped win WWII would now tackle the moon. In a remarkable win, the Apollo contract was awarded to North American on November 28, 1961. Interestingly, only two Mercury flights had taken place at the time. In the heated competition, North American had beaten McDonnell Aircraft for the contract to build the Apollo spacecraft, even though McDonnell had built the Mercury spacecraft and was developing the Gemini spacecraft. NASA was on a fast track and NAA was ready to accept the challenge. At the helm, Harrison Storms who was instrumental in winning the NASA contract now moved swiftly toward the execution phase.

North American also built the second stage of the 363-foot Saturn V rocket, and Rocketdyne (a division of NAA at the time) designed and built all of the engines for the three stages. During its peak in 1966, the Apollo program involved approximately 350,000 dedicated people and 20,000 companies throughout the United States. Today, another one of our accomplishments, the Space Shuttle, continues to carry out scientific missions and assembly of the International Space Station.

In the missile arena North American had developed the Navaho project, a booster and a piggy back missile initially tested as the X-10. This program, underway during the early 1950s, essentially produced the first cruise missile for the U.S. and the largest flight-tested ramjets. This experience would later help Rocketdyne become the world leader in rocket propulsion. In addition, the Downey, California-built air-to-ground Hound Dog missile gave the Strategic Air Command's B-52s a standoff capability.

For the Navy customer, NAA produced the Mach 2 tactical reconnaissance RA-5C Vigilante and the T-2 Buckeye trainer. The U.S. Marine Corps received the versatile OV-10 Bronco, which is still in service today with several foreign air forces.

Each subsequent program whether successful or not, became a stepping-stone to the future. Our leaders garnered the lessons learned, and their gained experience translated into confidence. The odds of succeeding when the next RFI arrived was greatly improved.

Another leader who joined NAA in 1952 at the Fresno, California modification center was Sam Iacobellis. In 1957, he transferred to the company's Rocketdyne division and held increasingly responsible positions eventually becoming vice president of Advanced Programs. Lee Atwood once commented on Sam, "His attitude of eagerness, and desire to work, desire to help people, his friendliness toward others and his consideration, together with his work ethics made him a very valuable prospect in my mind, and I felt he would contribute strongly wherever he might work, and turns out he did."

In 1973, Sam was named president of the Atomics International Division which, under his direction, expanded into the Energy Systems Group. I remember seeing Sam riding in the back of a pickup truck greeting the employees at the Hanford, Washington facility. I immediately thought that some day, I would like to work for that gentleman.

In 1981, things really heated up as Sam joined Rockwell International's North American Aircraft Operations as executive vice president and B-1B program manager. To recover from the ill-advised cancellation of the B-1A by President Jimmy Carter in June 1977, President Ronald Reagan announced on

October 2, 1981 that as part of his Strategic Modernization Program, 100 B-1Bs and 132 Advanced Technology Bombers, later designated the B-2, would be built. It would take a determined leader to keep the $20.5B program on track-and Sam did it! Not long after the contract award, four and sometime five of the sleek bombers were rolling out the door every month at the Rockwell Palmdale facility. To put that in perspective, the total parts for the assembly of a single B-1 is equivalent to fifteen F-16 fighters. The 100th B-1B rolled out of the factory on January 20, 1988—all 100 B-1Bs were built and delivered on time and within budget.

During recent operations in the Iraqi theater, B-1Bs dropped more than 70% of the GPS-guided Joint Direct Attack Munition (JDAM). The combination of the B-1B and JDAM weapons were so reliable, they were called on to hit targets missed by other aircraft, and to provide close air support for troops on the ground. Just think about that for a moment-a bomber flying close-air support!

B-1B crews were also capable of re-programming new time-critical target coordinates in flight, as new orders were commanded and approved in unprecedented record time. The B-1B has come into it's own and continues to create its own legacy. We owe a great part of that legacy to Sam's leadership and determination to guide this bomber program through its inception, production and delivery to the customer—he delivered results.

As another year of this second century of flight comes to a close, we mark the loss of so many of these pioneering leaders of our heritage company: Ralph Ruud, Sy Rubenstein, Morgan "Mac" Blair, Rocco Petrone, Norm Ryker, Robert Anderson, and NAA test pilots Scott Crossfield and Al White. But their legacy lives on in the skies over the front lines in the war against terror, in the airways traveled by millions of passengers each day, and in the great expanse of space. Their vision and leadership lessons live on, fostering a new generation.

The values that our NAA leaders embraced and led by example, will hold us in good stead as we move into the fifth defining era of aerospace: the intersection of information management and information technology. It is this marriage of platforms and networks that will enable the next great steps in innovation. It is the tradition of leadership handed down to us by these great leaders that will ensure that our industry is there to make it happen.



Photo from the Erik Simonsen Collection

The B-1 assumes its rightful position between the B-52 and the B-2 bombers in America's arsenal of strategic weapons.



About the Author: Jim Albaugh is president and CEO of Boeing Integrated Defense System. This $30.8 billion, 76,000-person business unit includes the company's total defense, government, intelligence, space and communications capabilities. Headquartered in St. Louis, the organization has operations in St. Louis; Southern California; Seattle; Houston; Huntsville, the Space Coast of Florida; San Antonio and Washington, D.C. Integrated Defense Systems is a provider of integrated solutions – joining network-centric information with integrated military air, land, sea and space-based platforms – for defense and civil organizations around the world.

Its talented people design, produce, modify and support a wide range of fighters, transports, aerial tankers, bombers, rotorcraft, surveillance and sensor platforms, radio and satellite based communication systems, missiles and munitions. The extraordinary range of related products and services includes missile defense, airborne lasers, battlefield management, and several advanced intelligence, surveillance and reconnaissance programs. The unit is the systems integrator of the International Space Station, produces a variety of satellites, provides human space flight and launch services support, and is a partner in Sea Launch.Integrated Defense Systems also serves commercial satellite customers, and is closely aligned with Phantom Works, Boeing's internal technology and advanced research and development arm.

Prior to his current position, Albaugh was president and CEO of Boeing Space and Communications (S&C) headquartered in Seal Beach, California. This unit merged in July 2002 with the company's Military Aircraft and Missiles Systems unit to create Integrated Defense Systems.

Under Albaugh's leadership, S&C grew to be the world leader in several key markets – including commercial and government communication satellites, human space flight, airborne surveillance and missile defense – and hold a significant position in launch services and classified programs. The prior four years, Jim was president of Boeing Space Transportation, a predecessor unit that was folded into S&C. He assumed that position after serving as president of Rocketdyne Propulsion & Power, part of the Rockwell aerospace and defense businesses acquired by Boeing.

A Washington State native, Jim joined the company in 1975 as a project engineer at its Hanford, Washington operations. A distinguished member of several industrial and technical societies, he is a Fellow of the American Institute of Aeronautics and Astronautics and of the Royal Aeronautical Society. He holds BS degrees in mathematics and physics from Willamette University and an MS degree in civil engineering from Columbia. Although heavily engaged in travel, Jim still maintains a residence in Southern California.

Postscript to Leadership – Inspiring Others

as related by an Unknown NAA Retiree

A young farmer glanced upward and noticed a biplane descending quickly toward his field with its engine coughing slightly. The aircraft skimmed low over several trees and landed on a dirt road - not bad, the farmer thought. Taxiing, the pilot tried to turn the airplane around, but the road was too narrow and the tail section wound up on the grass shoulder. The farmer, who was fascinated by airplanes, was anxious to meet the pilot and ran over to lend assistance. The distinguished looking aviator, introduced himself as Dutch, and the two of them managed to get the biplane turned around. After a short period of working under the engine cowling, everything seemed ready for a takeoff try. Prior to starting the engine, Dutch told the farmer, "If you're interested in a job working with airplanes, here's my address."

Several years later the aviation-spirited farmer wound up in Inglewood, California and decided to pay Dutch a visit. All he had was a note with an address, and he had no idea he was attempting to visit the president of North American Aviation (NAA). After a slight delay trying to convince security with his wild tale and that he actually knew Mr. Kindelberger, he was allowed to enter the facility. Dutch remembered the young farmer and immediately gave him a job at the NAA factory—such was the dynamics of the leader of NAA - inspiration and a promise kept.



Congratulations and Best Wishes to

Douglas and Daisy Alkire
of Monterey Park, California
celebrating their 55th Wedding Anniversary

Wayne and Virginia Dennis
of Henderson, Nevada
celebrating their 61st Wedding Anniversary

Gerald and Esther Funk
of Paonia, Colorado
celebrating their 63rd Wedding Anniversary

Larry and Kathy Larsen
of Chester, California
celebrating their 68th Wedding Anniversary

Wayne and Kathryn Sutton
of Banning, California
celebrating their 60th Wedding Anniversary

Clifford and Amelia Tombyll
of Wrightwood, California
celebrating their 60th Wedding Anniversary

Charlie and Katy White
of Spring Valley, California
celebrating their 25th Wedding Anniversary



Harry and Alice Desko
of Kansas City, Kansas
on their retirement from the
NAA-K B-25 Bomber Builders Newsletter
which they published since 1988

The B-17 Piggyback Story

by Ralph Kenney Bennett

Editor's Note: This story was published in the Fall 2003 newsletter of the National World War II Memorial Society. It has nothing to do with North American Aviation. However, at this time when the nation is at war and our people are so divided, it is good to look back to another time when our country was at war and our people stood together. It is the story of two B-17 bomber crews, twenty Americans doing their duty, whose fate was seared in a heartbeat. Some would live and some would die, but none would falter, even when they were making the final sacrifice.

They laid him to rest in the Peace Lutheran Cemetery in the little town of Greenock, Pennsylvania, just southeast of Pittsburgh. Glen Rojohn was 81, and had been in the air conditioning and plumbing business in nearby McKeesport. But like so many veterans, though he seldom talked about it, he could have told you one hell of a story! He won the Air Medal, the Distinguished Flying Cross and the Purple Heart all in one fell swoop in the skies over Germany on December 31, 1944.

One fell swoop indeed…

Capt. Glen Rojohn, of the 8th Air Force, 100th Bomb Group, was flying his B-17G Flying Fortress bomber on a raid over Hamburg. His formation had braved heavy flak to drop their bombs, then turned 180° to head out over the North Sea. They had finally turned northwest, headed back to England, when they were jumped by German fighters at 22,000 feet.

The Messerschmitt Me 109s pressed their attack so closely that Capt. Rojohn could see the faces of the German pilots. He and other pilots fought to remain in formation so they could use each other's guns to defend the group. Rojohn saw a B-17 ahead of him burst into flames and slide sickeningly toward the earth. He gunned his ship forward to fill in the gap. He felt a huge impact. The big bomber shuddered, suddenly felt very heavy and began losing altitude. Rojohn grasped almost immediately that he had collided with another plane.

A B-17 below him, piloted by Lt. William G. McNab, had slammed the top of its fuselage into the bottom of Rojohn's. The top turret gun of McNab's plane was now locked in the belly of Rojohn's plane and the ball turret in the belly of Rojohn's had smashed through the top of McNab's. The two bombers were almost perfectly aligned – the tail of the lower plane was slightly to the left of Rojohn's tailpiece. They were stuck together, as a crewman later recalled, "Like mating dragonflies."

Three of the engines on the bottom plane were still running, as were all four of Rojohn's. The fourth engine of the lower bomber was on fire and the flames were spreading to the rest of the aircraft. The two were losing altitude quickly. Rojohn tried several times to gun his engines and break free of the other plane.

The two, however, were inextricably locked together. Fearing a fire, Rojohn cut his engines and rang the bailout bell. For his crew to have any chance of parachuting, he somehow had to keep the plane under control. The ball turret, hanging below the belly of the B-17, was considered by many to be a death trap – the worst station on the bomber.

In this case, both ball turrets figured in a swift and terrible drama of life and death. Staff Sgt. Edward L. Woodall, Jr., in the ball turret of the lower bomber had felt the impact of the collision above him and saw shards of metal drop past him. Worse, he realized both electrical and hydraulic power was gone. Remembering escape drills, he grabbed the hand crank, released the clutch and cranked the turret and its guns until they were straight down, then turned and climbed out the back of the turret up into the fuselage. Once inside the belly of the airplane, Woodall saw a chilling sight, the ball turret of the other bomber was protruding through the top of the fuselage.

In that turret, hopelessly trapped, was Staff Sgt. Joseph Russo. Several crewmembers of Rojohn's plane tried frantically to crank Russo's turret around so he could escape, but, jammed into the fuselage of the lower plane, it would not budge. Perhaps, unaware that his voice was going out over the intercom of his plane, Sgt. Russo began reciting his "Hail Mary's".

Up in the cockpit, Capt. Rojohn and his co-pilot, 2nd Lt. William G. Leek, Jr., had propped their feet against the instrument panel so they could pull back on their controls with all their strength, trying to prevent their plane from going into a spinning dive that would prevent the crew from jumping out. Capt. Rojohn motioned left and the two managed to wheel the huge collision-born hybrid of an airplane back toward the German coast. Leek felt like he was intruding on Sgt. Russo as his prayers crackled over the radio, so he pulled off his flying helmet with its earphones.

Rojohn, immediately realizing that the crew could not exit from the bottom of his plane, ordered his top turret gunner and his radio operator, Tech Sgts. Orville Elkin and Edward G. Neuhaus to make their way to the back of the fuselage and out the waist door on the left behind the wing. Then he got his navigator, 2nd Lt. Robert Washington, and his bombardier, Sgt. James Shirley to follow them.

As Rojohn and Leek somehow held the plane steady, these four men, as well as waist gunner, Sgt. Roy Little, and tail gunner, Staff Sgt. Francis Chase, were able to bail out. Now the plane locked below them was aflame. Fire poured over Rojohn's left wing. He could feel the heat from the plane below and hear the sound of .50 caliber machine gun ammunition "cooking off" in the flames.

Capt. Rojohn ordered Lieut. Leek to bail out. Leek knew that without him helping keep the controls back, the plane would drop in a flaming spiral and the centrifugal force would prevent Rojohn from bailing. He refused the order. Meanwhile, German soldiers and civilians on the ground that afternoon looked up in wonder. Some of them thought they were seeing a new Allied secret weapon – a strange eight-engined double bomber.

But anti-aircraft gunners on the North Sea coastal island of Wangerooge had seen the collision. A German battery captain wrote in his logbook at 12:47 p.m.: "Two fortresses collided in a formation in the NE. The planes flew hooked together and flew 20 miles south. The two planes were unable to fight anymore. The crash could be awaited so I stopped the firing at these two planes."

Suspended in his parachute in the cold December sky, Bob Washington watched with deadly fascination as the mated bombers, trailing black smoke, fell to earth about three miles away, their downward trip ending in an ugly boiling blossom of fire. In the cockpit Rojohn and Leek held grimly to the

controls trying to ride a falling rock. Leek tersely recalled, "The ground came up faster and faster. Praying was allowed. We gave it one last effort and slammed into the ground." The McNab plane on the bottom exploded, vaulting the other B-17 upward and forward. It slammed back to the ground sliding along until its left wing slammed through a wooden building and the smoldering mess came to a stop. Rojohn and Leek were still seated in their cockpit. The nose of the plane was relatively intact, but everything from the B-17's massive wings back was destroyed. They looked at each other incredulously. Neither was badly injured.

Movies have nothing on reality. Still perhaps in shock, Leek crawled out through a huge hole behind the cockpit, felt for the familiar pack in his uniform pocket pulled out a cigarette. He placed it in his mouth and was about to light it. Then he noticed a young German soldier pointing a rifle at him. The soldier looked scared and annoyed. He grabbed the cigarette out of Leek's mouth and pointed down to the gasoline pouring out over the wing from a ruptured fuel tank.

Two of the six men who parachuted from Rojohn's plane did not survive the jump. But the other four and, amazingly, four men from the other bomber, including ball turret gunner Woodall, survived. All were taken prisoner. Several of them were interrogated at length by the Germans until they were satisfied that what had crashed was not a new American secret weapon.

Rojohn, typically, didn't talk much about his Distinguished Flying Cross. Of Leek, he said, "In all fairness to my co-pilot, he's the reason I'm alive today."

Like so many veterans, Rojohn got unsentimentally back to life after the war, marrying and raising a son and daughter. For many years, though, he tried to link back up with Leek, going through government records to try to track him down. It took him 40 years, but in 1986, he found the number of Leek's mother, in Washington State. "Yes, her son Bill was visiting from California. Would Rojohn like to speak with him?"

Some things are better left unsaid. One can imagine that first conversation between the two men who had shared that wild ride in the cockpit of a B-17.

A year later, the two were re-united at a reunion of the 100th Bomb Group in Long Beach, California. Bill Leek died the following year.

Glenn Rojohn was the last survivor of the remarkable piggyback flight. He was like thousands upon thousands of men from all walks of life who in the prime of their lives went to war. He died after a long siege of sickness. But he apparently faced that final battle with the same grim aplomb he displayed that remarkable day over Germany so long ago.

Let us be thankful for such men.

NAA Flying Horsemen Final Reunion

The 22nd and final annual reunion of the North American Flying Horsemen was held on September 28 through 30, 2006 at the home of Harry Shapiro in Yorba Linda, California. The Troop, which started in 1937, has dwindled from a peak of 151 to 17 active members due to age and illness. All assets will be donated to the Hope Ranch in Oregon, a qualified facility that provides horseback riding therapy for the handicapped.



Those attending the final reunion included: Top Row, L. to R.: Jim Canning, Martin Albert, Stan Mellin, Joan and Harry Shapiro, Audrey and Tim Corkery.
Bottom Row, L. to R.: Bob Morse, Diane Albert, Jim Walsh and Linda Morse. Mary Graef took the picture.

Still Picking Up Those Rocks In Space?

by Ed Rusinek

A few days ago, I stopped at a watch shop to have the power cell replaced in my wristwatch. My watch stopped running after a four, or was it a five, year period of very accurate time keeping. I began to think back to the time when you had to wind up your watch every second or third day. Then someone came up with a self-winding watch which relied on the movement of your wrist. Now, a little power cell, smaller than a dime, keeps my wristwatch running for years!

Some thirty odd years ago and some time after our Moon landings, I experienced a tear in my retina. I went to my ophthalmologist and he informed me that the tear in the retina appeared to be healing itself but that I was to refrain from any physical strain until it healed completely. If the tear returned, he would have to seal it using a laser beam. Knowing that I was in the Space industry and that I was scared out of my wits over my eye, the doctor tried to make light conversation by asking me, "Are you still picking up those rocks in Space?"

I was stunned. Here was a very well educated man thinking that all we did was spend billions of dollars to go out and pick up Space rocks. I told him, "The rocks were on the Moon. We now go out into Space to study our planet and to convert the things we learned for the benefit of mankind. The laser you mentioned to seal my retina, did you have such a device before the Space Program?" He suddenly realized that many of the improvements he had at his disposal were a direct or spinoff effect of the Space Program.

The benefits were almost immediate. If we could record the heartbeat and blood pressure of an astronaut walking on the Moon a quarter million miles away, why not do the same for a patient lying in a bed in a hospital ICU! From there, it was only a matter of time before the benefits reached out into every field of human endeavor.

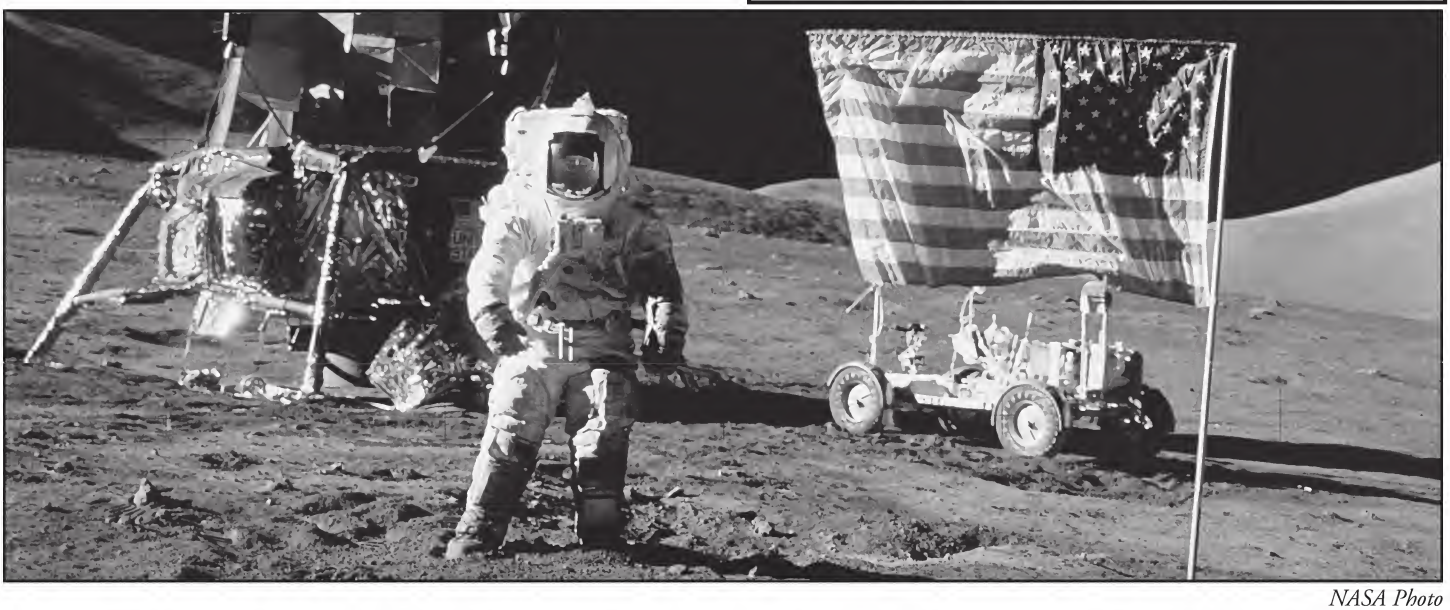
Similarly, a few months ago, a fast growing cataract developed in my left eye. I went in for the surgery. Working with an operating microscope, my surgeon made a small incision into the eye, used ultrasound to break up the cataract, applied a surgical solution to flush out the residue, installed a predetermined and premade plastic lens and, finally, closed the incision. Total time: less than 30 minutes. A few weeks later, a problem developed with my vision and I had to return to be treated with a YAG laser. The actual treatment lasted a few minutes and was totally painless.

Could any of this been done just fifty years ago before the Space Program came into being? Sure, we had running wristwatches and doctors were performing cataract surgery long before Man flew to the Moon. What we did not have were the tools of precision, accuracy, visibility and miniaturization that we have available today and continue to improve tomorrow. The transformation is so smooth and transparent that we do not even realize that it is happening! And that is why the general public, not fully aware of the giant leaps of progress that we have accomplished and continue to stimulate, still retains this vague notion of us going into Space to pick up more of those rocks!

Shame on NASA! Shame on us! We have failed to keep our people in the loop. They listen all day to hopped up rock stars singing stupid songs in blithering idiotic half tones and think that is all there is to life. They do not even have a clue of how we have changed and improved their lives. But, if we are to resolve the massive problems our nation will face ahead in terrorism, energy, pollution, hunger, disease, education, nuclear disaster-we must start now to mobilize all our resources, as we did during World War II and the Space Race—with the full support and knowledge of the American people.

Lunar Solution For Energy Problems

With the cost of gas hovering between $2 and $3 a gallon and the oil supply declining, NASA scientists have discovered a potential new energy source – Helium-3. When combined with water, the element creates energy. NASA engineer Donner Grigsby stated, "If you get a small amount of the material, an ounce, it's enough to power our five biggest cities for five years." There is just one hitch. Helium-3 exists mainly on the moon. That's one reason why the United States is eager to return to the moon.



NASA Photo

Contrails From The Past

by Ed Rusinek

Dear Ed,

My first NAA assignment was on the Saturn Second Stage Rocket for the Apollo Program. The Saturn S-II was initially located in Building 2, 4 and 5 in Downey and, subsequently moved to Building 80 and 81 in Seal Beach. Over the years, I worked on the big IBM mainframes with the Space & Information Systems Division (S&ID) computers located in Building 1, then Building 4 in Downey and, finally, in Building 80 in Seal Beach. Initially, our work had to be coded in FORTRAN and punched on cards, which were loaded into the mainframes. It usually took at least one day to get the results. Eventually, engineers were able to code directly onto the mainframes from their desks using the IBM TSO (Time Share Option). This eliminated the keypunching process and greatly reduced the debugging process. In the end, the big mainframes were replaced by desktop computers.

—Ken Ryan, La Mirada, CA

Ed's Ans: Thank you for reminding us of the days when getting data from Seal Beach was often a tremendous hassle. Ask for a one liner per item tabulation, you would get buried in a printout requiring a page per item. Those mainframes had so much capacity, the Seal Beach operators always had to show off their capabilities.

Dear Ed,

Thank you for the article by Paul McCormick in the Fall Issue. At the annual NAA Columbus Division reunion held at the former NAA Park on Sunday, September 20th, I took the enclosed picture of Paul. He looks well and is doing great!

—Edward Kelley, Newark, OH



Ed's Ans.: At the risk of getting flooded with "He is looking good" pictures, we thank you for this bit of social news indicating that Paul and the NAA folks at Columbus are still active and very much alive.

Dear Ed,

Congratulations on your Fall Issue—it was one of the best ever. North American Aviation was a wonderful place to work. My assignments ranged from underwater to the Moon. It was always interesting and challenging. Best of all, you got paid too!

—Paul Imrisek, Elk Grove, CA

Ed's Ans.: Thank you Paul, for your kind words. Although we are only a small volunteer retiree organization, we insist that the bulletin reflect the very best that was identified with North American Aviation.

Dear Ed,

Congratulations on the wonderful detailed history of the X-15, which was an important development in aviation and space exploration.

In early 1955, we received a Request for Proposal for the design and manufacture of two X-15 research aircraft. My task was to develop our program price using Engineering and Manufacturing inputs as well as my own. The Government had allocated $36M for two aircraft. Our price proposal was $43M for a CPFF (Cost Plus Fixed Fee) contract. Mr. Kindelberger was looking for production contracts and was reluctant to go ahead with the CPFF X-15.

In the end, Harrison Storms and his supporters convinced Dutch to accept the $36M price. Later on, a third aircraft was added to the contract. I understand that the final cost rose to $80M, which, of course, included the third aircraft, maintenance support, spares, repairs and changes to the flight program.

—Phil Reardon, Manhattan Beach, CA

Ed's Ans.: Bill Dana gave us a terrific insight into the X-15 and the complexity of the machine. You have provided us a glimpse into the evolution of the project. Thank you.

Official Rollout of X-15 No. 1 at LAD on October 15, 1958



Photo from the Erik Simonsen Collection

The Silent Majority

by Stan Guzy

ANDERSON, ROBERT, 85 – died at his home in Los Angeles, CA on October 30, 2006 of cancer. He was president of Rockwell International from 1970 until 1979 when he became its chairman and CEO, retiring in 1988. During his tenure, NAA/RI was the prime contractor for the first five space shuttles and the plan to build 100 B-1 bombers was also revived. As a result, NAA/RI tripled in size and was transformed into one of the world's largest aerospace companies. His wife Diane survives him.



John Tribe and Tom O'Malley briefing Anderson at KSC – Circa 1970's

ASARO, JOSEPH J., 86 – died on October 2, 2006 of complications resulting from a stroke. He had been a timekeeper at NAA/RI prior to his retirement. His wife Hortense preceded him in death.

AVERILL, ROBERT J., 71 – of Anaheim Hills, CA died on August 23, 2006 after a lengthy battle with Parkinson's disease. His wife Jeannie survives him.

BOWSER, LAWRENCE, 63 – died on October 5, 2006 from complications resulting from lung transplant surgery. He was a veteran NAA/RI employee before retiring from Boeing after 35 years of service. His loving wife Joyce survives him.

BUZZATTO, ANGELO "BUZZ", 83 – died in Torrance, CA after a long battle with Alzheimer's disease. He joined LAD and served for 35 years in tooling, retiring in 1988. He is survived by his wife of 41 years, Tommie.

CAZARES, WILLIAM S. "BILL", 87 – of Salinas, CA passed away on January 30, 2006. Bill served in Tool Design and Tool Engineering for over thirty years.

DAVIES, MERNA, 87 – died in Modesto, CA on June 1, 2005. Merna worked for many years as a secretary at the LAD and B-1 Divisions. Prior to retirement she served in the Aerodynamics Group. Her daughter Linda informed us of her passing.

DOUGLASS, JOYCE (MACKENZIE), 72 – passed away from Alzheimer's disease on March 30, 2005 in New Jersey where she lived near her daughter. Joyce began her career at NAA/RI as a secretary and eventually worked on "black" programs in Advanced Design at LAD for several years. She retired in 1986 after 25 years of dedicated service.

DOYLE, VINCENT A., 89 – died on May 17, 2006 in St. Paul, MN from unspecified causes. At NAA/RI he served as an engineering coordinator for experiments conducted by the astronauts on the Apollo/Saturn programs. His wife of 63 years, Mary, survives him.

EDWARDS, PAUL R., 76 – lost his battle against cancer at his home on August 7, 2006. Paul began his engineering career at NAA/RI on aircraft programs, and later on the Apollo, Space Shuttle, Space Station and GPS programs. He retired in 1990 and is survived by his wife Lara.

GASKINS, GEORGE T., 76 – a resident of Orange, CA, he passed away on September 25, 2006 at Long Beach Memorial Hospital after a short illness. George was an NAA/RI retiree and is survived by his wife Norma.

HANSEN, MARGARET A. "MARGE", 72 – died in Santa Maria, CA on September 19, 2006 after a courageous battle with breast cancer. Marge started at the Downey facility in 1961 and served as departmental secretary for 31 years at Downey, Seal Beach, Sabreliner and LAD until she retired in 1992. She met her husband, John Hansen, at LAD where he served in Industrial Security. They were married for 33 years until he preceded her in death.

HERMAN, DR. JOHN J., 82 – passed away on August 29, 2006 in Cambria, CA. He retired from Autonetics in 1986 after more than 30 years of service. John was the Adjutant of Chapter 96 of the Disabled American Veterans in Cambria. His wife Patsy survives him.

HINES, ORA L., 92 – passed away on August 15, 2006 in Seattle, WA from undisclosed causes. He worked at NAA/RI as a procurement inspector in the Material Department prior to retiring. His wife Helen preceded him in death.

HORTON, HAZEL "PEGGY", 80 – passed away at home in Carson, CA on June 30, 2006. She served at LAD, Crenshaw and Compton before moving to Space Division in Downey. Peggy worked on the Space Shuttle program as a laboratory technician, retiring from Seal Beach after 30 years of service.

HYNES, WILLIAM T. "BILL", 78 – of Rancho Palos Verdes, CA passed away on September 6, 2006 of a melanoma. Bill joined LAD as a specifications engineer and worked on the F-86, F-100, X-15 and the XB-70. He retired in 1990 after 35 years of service. His wife Peggy survives him.

JAQUA, EMILY – of Camarillo, CA lost her battle with lung cancer on June 25, 2006. Emily served for many years in the data analysis organization at Rocketdyne.

JAQUA, VANCE, 77 – lost his battle with leukemia on June 27, 2006 two days after his wife, Emily, passed away. Vance served 29 years at Rocketdyne, designing and developing rocket propulsion systems including the Gemini and Apollo attitude control rockets. He also worked on the injectors for the Lunar Module Ascent Engine, Peacekeeper fourth stage and the Space Shuttle Main Engine.

JOLLIFF, EARL R., 94 – passed away at his home in Hemet, CA on June 9, 2006 of natural causes. Earl retired from LAD in 1976 as a manufacturing supervisor of classified products and materials with 35 years of service. His loving wife Mildred Louise survives him.

KINDELBERGER, GEORGE W., 74 – succumbed to lung cancer at his home in Placentia, CA on March 31, 2006. George, a nephew of "Dutch" Kindelberger, retired from Space Division in 1990 after 40 years of service. He was buried at the Riverside National Cemetery in Riverside, CA. He is survived by his loving wife of 55 years, Leida.

KOONS, DONALD L., 77 – passed away in his sleep on October 17, 2006 at his home in Rancho Palos Verdes, CA. Don retired from LAD, where he was an avionics manager on the B-1, in 1986 after 30 years of service.

LINDQUIST, JAMES, 75 – died on November 5, 2006 from undisclosed causes. He retired in 1986 after a long career at the Rocketdyne Division. His wife Vara survives him.

LOOP, RICHARD "DICK", – a resident of Kernville, CA, died from unspecified causes on May 29, 2006 after suffering from

ill health for several years. Dick retired in 1988 after 35 years of dedicated service in engineering management at Navigation Systems. He is survived by Micky, his wife of 57 years.

McCLEARY, RALPH W. JR., 85 – of Rancho Palos Verdes, CA died of prostate cancer on November 22, 2006, Ralph joined LAD in 1940 in Manufacturing. Before transferring to Space Division, he was an assistant to Ralph Ruud. In Downey he served in Manufacturing and Facilities, retiring as a supervisor of the Sheet Metal Department in 1983 after 43 years of service. He is survived by his wife Shirley.

McQUILLEN, WARREN D., 80 – succumbed to prostate cancer at home in Bellflower, CA on October 31, 2006. Starting at the bottom, Warren retired in 1983 from Space Division as Director of Hardware and Equipment Development with 36 years of service. He is survived by his loving wife of 61 years, Betty.

MOOREHEAD, BRUCE H., 79 – died in Plano, Texas on August 19, 2006 from unspecified causes. Bruce had worked at NAA/RI on various engineering projects including the investigating committee of the Apollo 1 spacecraft fire and the final acceptance of the main engine for the first Space Shuttle used by NASA. He was also past president of the Anaheim chapter of the RI Management Association. Evelyn, his loving wife of 59 years, survives him.

MORAWSKI, JULIAN, 89 – passed away in Boise, ID on September 22, 2006 of prostate cancer. Julian served as a structures engineer on the B-1, Apollo and the Space Shuttle. He was born in Poland and served in the Polish Army during the September 1939 German invasion. Taken prisoner, he escaped from a moving POW train, and then smuggled his way to join the Polish Army in exile in France. When France collapsed, his unit continued to fight and retreat in an orderly manner until taken off the beach by a British destroyer, one month after the debacle at Dunkerque. Based on his single parachute jump as a cadet in prewar Poland, he was sent to Ringway Airport to train Allied paratroopers and secret agents in the skills of parachuting. To provide paratroopers immediate access to their heavy weapons, he developed and tested the method to strap the weapons to the troopers and then to release them as they approached the ground to slow down their own descent. Completing his assignment at Ringway, he rejoined the 1st Polish Parachute Brigade in Operation Market Garden and the liberation of Holland. He was an exceptional engineer and a good friend.

O'DONNELL, WILLIAM R., 89 – died on May 3, 2006 in Playa del Rey, CA from unspecified causes. Bill retired from Space Division where he had helped build the Apollo 11 Command Module and the first Space Shuttle.

PETRONE, ROCCO A., 80 – died at his home in Palos Verdes Estates, CA on August 24, 2006. A graduate of West Point, he began his career in Space on the Redstone ballistic missile program as an Army mechanical engineer. On loan to NASA, he worked on the Saturn program at KSC in Florida. From 1966 to 1969, he served as director of launch operations that included the Apollo 1 disaster and the Apollo 11 successful landing on the Moon. In 1969, he was named Apollo program director in Washington and in 1973; he was made director of the Marshall Space Flight Center in Huntsville, Alabama. Ending his NASA career in 1975, he joined Rockwell International in 1981 as head of the Space Transportation and Systems Division. He is survived by his wife of 50 years, Ruth.

REEKSTIN, JOHN P. JR., 67 – passed away suddenly on October 26, 2006 from undisclosed causes. John was a physicist and marketing director who came to NAA/RI in 1973 to develop and implement new technologies in the aerospace/missile defense industry. His wife of 46 years, Judith, survives him.

ROBERTSON, WILLIAM L., 71 – passed away on October 4, 2006 at his home in Corona, CA following a recent illness. Bill served as an aerospace engineer at NAA/RI for 28 years before retiring. His wife of 48 years, Rose, survives him.

SCHILLINGER III, HENRY N., 65 – died on November 3, 2006 in Cedar Rapids, IA after several years of battling various cancer complications. Henry retired from Rockwell Collins after 27 years of service. His wife Judith survives him.

SIMON, HELEN S., 89 – of San Juan Capistrano, CA passed away on September 1, 2006 of vascular complications. Helen retired from Autonetics where she was a lead woman in 1984 after more than 30 years of service.

STAGNARO, FRANK J., 81 – passed away in Long Beach, CA on November 13, 2006 from brain cancer. Frank joined NAA in 1957 as a buyer and retired in 1984 after 27 years of service as a procurement manager on the Space Shuttle. He is survived by his caring wife of 43 years, Marilyn.

STUDHALTER, WALTER R., 85 – of Woodland Hills, CA, died of a heart attack while climbing in the Cargo Muchacho Mountains in California on July 14, 2006. In the 1950s, Walt was the Rocketdyne Redstone Engineer for Explorer 1, placing America's first satellite in Earth orbit and for the Mercury vehicle making Alan Shepherd the first American in Space. He later was the program manager for the first Saturn J-2 Engine program.

VAN BLOM, WALTER "SLIM", 87 – passed away on April 7, 2006 in Port Townsend, WA. Slim started working in aircraft on the DC-3 at Douglas. He retired from LAD in 1972 after 26 years of service. His wife Mariana survives him.

VAN QUEKELBERG, ARTHUR R., "VAN", 78 – passed away on May 20, 2006 after a brief battle with lung and brain cancer. He joined NAA in 1951 as an accountant at the Columbus Division. He relocated to Fountain Valley, CA and worked at the central payroll department in Seal Beach, CA. Van retired as a manager of central payroll operations in 1987 after 36 years of service. His loving wife Brenda survives him.

WICKENS-HOFFMAN, JUNE, 69 – died of lung cancer on October 16, 2006 at her home in Camarillo, CA. June worked as a secretary at Autonetics for John Moore and at the NAA International office. Her husband Robert survives her.

WILHELMI, EDWARD H., 83 – died in Las Vegas, NV on September 20, 2006. Ed retired in 1978 from Space Division after serving 23 years in procurement management, primarily on Saturn S-II. His wife Patti survives him.

LOST SHEEP – BULLETIN RETURNED WITH NO FORWARDING ADDRESS

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North American Aviation Retirees Bulletin

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IF THE DATE ABOVE YOUR NAME IS DECEMBER 2006 AND YOU HAVEN'T YET RENEWED –
THIS IS YOUR LAST ISSUE!





Photos from the Erik Simonsen Collection

In 1935, Dutch Kindelberger convinced seventy-five families to pack their entire belongings into their cars, leave their homes in Dundalk, Maryland and drive to Inglewood, California, a distance of over 2,700 miles. They traveled in a caravan with stops, scheduled and unscheduled, on many dusty and unpaved roads. When they arrived in the Palm Springs area, the more venturesome even climbed to the peak of San Jacinto Mountain. These original employees that made the trek to California were later called the "Bald Eagles" of North American Aviation.

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION Retirees Bulletin

Spring 2007

Inside: **INTRODUCING THE FJ-3 FURY TO THE FLEET** by Archie Lane

SOLVING THE F-100 ELECTRICAL ISSUE by Warren Helsley

TO SNATCH A SABRE by Ralph Wetterhahn



Photo from the Larry Davis Collection

On May 20, 1951, members of the 4th Fighter Interceptor Wing examine North American Aviation F-86A-5, Aircraft No. AF49-1339, flown by Capt. James Jabara during a fighter sweep over the Yalu River in which 24 F-86s engaged 50 MiG-15s. Although standard orders required Capt. Jabara to return to base when his right drop tank hung up, he continued to press the attack and accounted for two enemy aircraft. Returning to base at K-13, he was credited with a total of six kills and became the first jet-vs-jet ace in history. The pilot in the foreground with a parachute is Lt. Ralph D. "Hoot" Gibson, the third ace of the Korean War. Note the drop tank still under the right wing.

NORTH AMERICAN AVIATION
Retirees Bulletin

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DEAR NAA RETIREE BULLETIN SUBSCRIBER

Every time we print an issue, we think it will be hard to come up with articles to match the quality of the ones we just completed. However, with this issue, we once again have some great authors and we are very proud and pleased to publish their magnificent works. For the first time, we have a freelance writer, Ralph Wetterhahn, whose article reads like a chapter from Tom Clancy; only his story is not fiction. He writes about how the Russians recovered the wreck of an F-86 off a North Korean beach and hauled it to their flight center in Moscow for study and comparison evaluation with the MiG-15. With the opening of former Soviet military archives, Ralph has actually gone to Russia and questioned the principals involved in this cloak and dagger enterprise.

After our unrelenting persuasion, we got our test pilot from the Columbus Division, Archie Lane, to relate his experiences with the new FJ-3 *Fury* as a young Navy pilot assigned to Squadron VC-3 at Moffett Field after returning from squadron deployment aboard a carrier in Korean waters. Although the FJ-3 was third in the series of jet fighter aircraft provided by North American Aviation to the Navy, it demonstrated some heart stopping idiosyncrasies of its own until the problems could be identified and resolved.

The third author, Warren Helsley, helped solve a major design issue with the F-100 electrical system Constant Speed Drive. Warren brought back some memories when he provided some original analyses on the CSD, sketched on North American Aviation vellum. Wow! How many pads of those vellums did I use up to document my stress analyses on the Navaho, starting with the X-10 Nose Gear Door?

With subscription renewal time, we again have lost many of you to the Silent Majority, to illness, and to melancholic depression brought on by old age. We know that feeling well because we are there ourselves! Our beloved company, North American Aviation, has gone to the dustbin of time! Our heritage, so rich so proud and so glorious, has been erased as if it never existed. All we have left is this bulletin to record our daring, our successes, our accomplishments and even our failures! So Johnny, beat that drum loud and clear because we refuse to slink off into the darkness! And when we finally cross over, we shall design and build the finest wings the angels ever flew!

The 45th Bald Eagles Reunion Will Be Held
on Saturday, April 14, 2007
at the Proud Bird Restaurant
11022 Aviation Blvd. (at 111th Street)
Doors Open for Social at 10:00 AM
Seating for Lunch at 12:00 Noon

Send your check for $20.00 payable to Bald Eagles Inc. to:

Val Yarbrough (805) 646-2283
520 Del Oro Drive
Ojai, CA 93023-1805

Include with your check the name you wish on your badge and the name of each guest included in your payment. Tickets and badges will be issued as you register at the door.
Preferred seating is limited so order your tickets early. Tickets will be sold at the door. Sorry, no refunds after March 26, 2007.

There are no service requirements to attend –
just the love for Airplanes and Spaceships

Meet old friends—Make new ones!
Parking is limited—Carpooling and early arrival is encouraged!

NAA/ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club members have joined the UAW retirees, meeting at the UAW Regional Hall at 6508 S. Rosemead Blvd. in Pico Rivera, CA on the 4th Wednesday of each month at 11:00 AM. Contact Frank Zelinski at (562) 866-3195 for more information.

The Antelope Valley Retirees Club meets in the South Meeting Room of the Palmdale Culture Center at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell/Boeing retirees are welcome.

Valley Aerospace Retirees Club meets on the 3rd Thursday of each month at the Pratt & Whitney Rocketdyne Fitness Center at 8500 Fallbrook Avenue, Canoga Park, CA. The president is Dennis Larson at (818) 340-6031.

Boeing Retirees Breakfast Club meets on the 1st Wednesday of each month at 8:00 AM for breakfast at IHOP Restaurant, corner Fallbrook and Vanowen in West Hills. Contact Howard Seese at (818) 344-7861.

"The Old LAD Stress Group" meets for breakfast approximately every two months at Mimi's Café in Torrance, CA. If you are from the old LAD Stress Group contact Gene Laxton at (310) 378-3113 or Ed Rosenthal at (310) 375-8933.

"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meet at 11:30 AM on the 2nd Wednesday of the month for lunch at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd. and Mariposa Ave.

The NAA 101 Tooling Retirees Group meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at Billy's Restaurant, 5160 190th St., west of Anza Avenue in Torrance, CA.

GPS Breakfast Club meets from 7:00 AM to 8:00 AM every Wednesday at the new Primrose Restaurant, Leisure World Shopping Center at Seal Beach Blvd. and Westminster Blvd. All are welcome! For more information, call Fred Shitara at (714) 746-4426.

Seal Beach Retirees Group meets at 11:30 AM on the 3rd Wednesday of the month at "The Fish Co." on Los Alamitos Blvd. at Katella Avenue. For more information call Marvin Blaski at (714) 848-5717 or e-mail to *mblaski@aol.com.*

The Facilities, Industrial Engineering and Plant Services Retirees Group meets at 11:45 AM on the 2nd Thursday of each month at Buster's (formerly Jolly Roger's) Restaurant in the Long Beach Marina. Contact Joe W. Mausser at (562) 596-5845.

"Ye Olde Pharts Breakfast Club" meets at 10:00 AM on the 4th Thursday each month for breakfast at Polly's Pies at 2025 N. Tustin Avenue in Orange. For information call Frank Luis at (714) 639-0990.

The North American Rockwell Retiree Club of McAlester, OK (a satellite of Tulsa, OK) meets at 10:30 AM on the 3rd Tuesday in March, June, September and December at the Down Town Meeting Place. Call J.A. Darden at (918) 423-0706 for more information.

Tulsa & McAlester Retirees meet for breakfast at 8:00 AM on the 2nd Monday in March, June, September and December at the Ramada Inn, 8181 East Skelly Drive in Tulsa, OK. Call Harry Phillips at (918) 838-3716.

The North American Rockwell Retirees Group of Columbus, OH Engineers and Professionals meet at 11:30 AM on the 3rd Thursday of each month at the Berwick Park House. Contact Byron C. Solomides at (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH meets at Noon on the 1st Monday of the month at the Whitehall Community Park on North Hamilton Road in Whitehall. Contact E. Hamilton at (740) 927-5940 for information.

Autonetics Group including Marine Systems, Program Office, Project Office, System Test, Engineers and Designers meets for lunch on the last Wednesday of each month at the HomeTown Buffet, Rose Ave. and Alta Vista Dr. in Placentia, CA. Call Mike Vohs at (714) 762-1925 for more details.

Autonetics Industrial Engineering and Maintenance Retirees meet for lunch on the 1st Thursday of each month at the HomeTown Buffet, 390 McKinley, located in front of the Home Depot, in Corona, CA. For more details, call Don Burk at (909) 698-0072.

Autonetics Retirees meet for lunch at 11:45 AM on the 2nd Wednesday of every month at the Rembrandt Restaurant or Yorba Linda Country Club. All Autonetics retirees, spouses and friends are invited. Contact Robert Nease at (714) 516-1844 or e-mail to *rfnease@email.msn.com* or Ed Venanzi at (714) 779-5652 or e-mail to *Ed-LindaVenanzi@adelphia.net.* See website: *www.geocities.com/nrba_of_a.*

A Group of NAA Retirees meets for breakfast at 8:15 AM on the 1st Wednesday of each month at Knott's Berry Farm-Chicken Restaurant. All are cordially invited. Contact Maxine Haun at *maxi3131@sbcglobal.net.*

Autonetics Financial Luncheon Group meets for lunch at Noon on the last Wednesday of the month at Marie Callendars, 126 East Yorba Linda Boulevard in Placentia. Contact Ken Cantwell at (714) 970-7171 or e-mail *Kcantwell@adelphia.net.*

A Group of Engineering Mgt. meets at 11:30 AM on the 3rd Tuesday of the month for lunch at Denny's on Imperial Hwy. and the 57 Fwy. in Brea. Call Earl England at (714) 528-0614 for information.

NAA Tech Reps Assn. (TRA) Breakfast Club meets at 9:00 AM on the 1st Tuesday of each month at Bobby's at 4901 El Camino Real in Carlsbad. For more information, call El Presidente Rafael Colunga at (760) 940-0525.

Material Group Retirees from Downey and Seal Beach meet at 11:30 AM on the 4th Wednesday of every month at the Stox Restaurant at Imperial Hwy. and Bellflower Blvd. in Downey. Contact Marian Nielson at (562) 429-1020 or Joan Dominguez at (562) 865-7200.

NAA/Rockwell Vandenberg AFB Retirees Breakfast Club meets at 8:45 AM on the 2nd Thursday of each even month at the Bakers Square Restaurant at 1841 S. Broadway in Santa Maria. Contact Marv Bailey at (805) 929-6552, Al Finlay at (805) 937-3690 or Bob Broggie at (805) 937-4674.

KSC Rockwell KMA Club meets on the 2nd Thursday of each month for lunch at the Florida Seafood Restaurant in Cocoa Beach. Contact Jerry Pruitt at (321) 636-9417 for details.

The Hangar Gang meets at the Proud Bird approximately every 4 months. For time, date and other details, call Gene Salvay at (818) 788-3974 or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

ANNUAL EVENT

Bald Eagles 45th Annual Reunion will be held on Saturday, April 14, 2007 at the Proud Bird Restaurant. Call Val Yarbrough at (805) 646-2283.

Flight Test Instrumentation Annual Reunion – This group of retirees meets annually at the Fullerton Elks Club. For information, call Frank Vigil at (562) 691-0236.

Tech Rep Association Picnic – A group of retired Field Service Technical Representatives has a yearly picnic in June at a park in Fallbrook, CA. For more information, call TRA President Rafael Colunga at (760) 940-0525 or e-mail to *pilotrafael@sbcglobal.net.*

The Annual M&P, P.D.L., "Friends Christmas Luncheon" – This group assembles in mid-December for a festive luncheon. Those wishing to participate and receive notice of the next December luncheon, call Fred Koeller at (310) 545-8854.

Information Systems Center Annual Reunion will be held Tuesday, May 15, 2007 at Khoury's Restaurant in Long Beach Marina at 4:30 PM. Contact Nelson Slagle at (714) 514-9139 or *neslagle@hotmail.com.*

Autonetics Group 69 – Luncheon Reunion will be held at 11:00 AM on Wednesday, March 27, 2007, at the Alta Vista Country Club in Placentia. Contact John C. Pinson at (714) 637-9146 or *jcpinson@sbcglobal.net.*

B-1B Reunion – 4th and Final Luncheon will be held at 11:00 AM, September 22, 2007, at the Golden Sails Hotel in Long Beach. Tickets are $16.00. No tickets at the door. Call Lee French at (530) 273-3069 or Lynn Isomoto at (562) 496-5604.

Introducing the FJ-3 Fury to the Fleet

by Archie Lane

In early 1954, I stepped inside the huge metal Dirigible Hanger at Moffett Field in Northern California and was overwhelmed by its vastness. I was a young freshly promoted Lt. JG (junior grade), back from my first squadron deployment as an AD-4 (A-1) Skyraider pilot on the U.S.S. Yorktown. I had responded to Squadron VC-3's call for night fighter volunteers. They were obviously short of pilots or they would not have accepted me. At the time, night flying off aircraft carriers was considered a specialized line of work, generally limited to second tour aviators with two or three deployments experience.

I saw it as an opportunity to move from props to jets since VC-3 was moving from F4U-5N Corsair props to F2H-3 Banshee jets. VC-3 at Moffett and VC-35 at North Island provided night fighter and night attack "teams" of four planes, five pilots respectively to each carrier deployment. It was brash on my part but I didn't realize it at the time. I figured I could handle it because I had already qualified at night aboard ship in the Skyraider as part of a small number of first tour aviators trained as nuclear bomb delivery pilots; normally, a mission only assigned to the experienced VC-35 pilots.

At first, VC-3 didn't quite know what to do with me so I was sent to the jet Instrument Training Unit which shared the monster hangar with VC-3. They had a two-week program to sharpen up the instrument flying skills of jet pilots. I guess VC-3 figured if I could get through the course they would be able to make something out of me. My first jet ride, and several thereafter, were in the back seat of a TV-2 (USAF T-33) with the hood up. It was quite a challenge but I was highly motivated and didn't know that there was speculation I wouldn't make it without "remedial" training. But ignorance is bliss and at the end of two weeks, I passed the final check and became a "jet pilot". At least as long as I didn't look outside.

So they started checking me out in the F2H-3 where the big challenge would be running the radar to intercept bogies while flying the airplane on solid instruments. Years later, in the F4H Phantom they gave me a RIO (Radar Intercept Officer) in the back to run the radar.

Meanwhile, the Navy was wrestling with the problem of experienced pilots who were assigned as squadron COs, XOs, operations and maintenance department heads smashing into the back end of aircraft carriers on jet landing approaches. Heretofore, with prop aircraft, this sort of accident was unheard of. It was bad enough when the new guys did it, but when old hands started doing it something had to be done. The answer was more training.

These experienced (in props) pilots needed a crash course (pun intended) in how low aspect ratio swept wing aerodynamics works (or doesn't work very well) with jet engines that have slow response to throttle movement, particularly on landing approach. So the JTTU (Jet Transitional Training Unit) was born. VC-3 was assigned six of each new swept wing jet carrier type aircraft and we were to turn the prospective squadron leaders into competent swept wing jet pilots before they went to their squadrons. At this point, the JTTU needed a ground instructor to teach swept wing aerodynamics and jet engines. The detachment CO was Bud Salsig and he and the other principals in this new outfit could well have taught it. But they



Photo courtesy of the Boeing History Archives Office

The Columbus built FJ-3, Aircraft No. 136135, equipped for the Navy with folding wings, four 20mm (MK-12) cannons and the J65-W-2 Sapphire engine.

anticipated being very busy, flying the neat new airplanes as instructors. Besides Lt. Commanders and Commanders don't teach ground school if they don't have to. I was an engineering graduate of Northrop Aeronautical Institute, so they passed me off as an aeronautical engineer and I set up a short course.

We received six F9F-6 Cougar jets quickly, since they were in fairly wide service by then, and were the type frequently involved in the carrier ramp strikes. In due course we received six F7U-3 Cutlass types, the tailless wonder of the time, from "Project Cutlass" at NAS Miramar which had been set up to do the same job as JTTU, but just with the F7U-3 aircraft. Our first FJ-3 Fury out of NAA Columbus arrived in October of 1954 and since I was well down the pecking order, my first flight in the Fury took place on December 29, 1954.

F9F-6 and FJ-3 instructors were selected from VC-3 pilots, all more experienced than me, with each aircraft type having a team leader who was a Test Pilot School graduate. Don Snowden was F7U-3 team leader and later became an admiral. Wally Schirra was another F7U-3 guy. He worried that his Navy career was going no place but he did O.K. with NASA, as one of the "Original 7" Mercury astronauts. Bob Baldwin was team leader of the FJ-3s and made LCDR in 1955 before I left. He went on to become CINCPAC (Commander in Chief Pacific), which I think is a Four Star job. He and I had a two-man car pool where I learned a lot by keeping quiet and just listening to him talk (rare for me, by the way). The association with this group was a rare privilege and a real education which influenced the rest of my life.

The F9F-6s we received were thoroughly used airplanes which were diverted to us instead of going through the Alameda O&R. They were tired and didn't have the latest-greatest mods in them. Generally, we just put fuel in them, jumped in, pulled the covers off the fire warning lights and removed the bulbs because they either came on shortly after engine start or would always come on during the flight. I had two flameouts in the F9F-6s, one

at high altitude which I air started successfully and the other terminated in a flame-out landing at Moffett Field. I also lost a canopy at 450 knots due to a worn latching mechanism.

But the prize adventure went to another instructor who took off without having the folding wings locked properly and made it around the pattern to a successful landing with both wings up at about a 30-degree angle. They were held there just by the wing fold actuator hydraulic pressure. This incident was also due to worn and sticking linkages. Since I want to cover the FJ-3 in depth I will just note that we lost four F7U-3s in 1955. Two were engine bay fires and explosions on take-off and two were stall/post stall gyration incidents in maneuvering flight. All the pilots got out with minor or no injuries.

The Navy FJ series was derived from the F-86E with the FJ-2 having structurally beefed up folding wings, catapult hooks and a tail hook system added. With the extra weight, the airplane was underpowered even though engine thrust had been increased from 5,200 lbs in the F-86 to 6,000 lbs in the FJ-2. The FJ-3 corrected the power problem with the British Sapphire engine built in the U.S. by Westinghouse. The FJ-3 again increased in weight but the engine put out over 50% more thrust, being rated at 7,800 lbs. We all loved it. It was the nearest to an aeronautical hot rod we had ever flown.

We had irritated the SAC crews out of Castle AFB at Merced, California by making gunnery runs on B-47s with our F9F-6s and then found ourselves taunted by their new B-52s cruising in untouchable splendor at 45,000 ft over the Bay Area, 5,000 to 6,000 ft above our ceiling.

Now we had an airplane to get at them again. Also, we had a worthy opponent for the F-86D Air Defense Command guys stationed at Hamilton Field just north of the Golden Gate. With their afterburner engines they had about the same thrust as the FJ-3 and gave us fits flying the F9F-6s. Mount Diablo just east of Oakland was the informal engagement area but anyone was fair game anywhere the "enemy" was found.

In those days, airspace was not formally restricted the way it is now. Jet airliners were just starting to be introduced so the sky above 20,000 ft belonged to the military by default. We used it all, right down to the ground too, but avoided the commercial airports and the approach areas to them. Many memorable dogfights ensued starting over Mt. Diablo and only ending when fuel state required a hasty retreat to home. Generally, 5,000 ft was considered the minimum altitude for this informal combat with Mt. Diablo peaked at 4,000 ft. But this rule frequently got bent when we ended up over lower terrain.

One memorable day, we all ended up at about 2,000 ft right over Moffett Field. When I got down to 400 lbs of fuel (about 60 gallons) I came to idle and dove right into the traffic pattern at Moffett. I don't know what the F-86 guys used for fuel to get back to Hamilton but no one crashed so they all made it. Another day the mock combat started right over San Francisco above 35,000 ft. The atmospheric conditions were just right for condensation trails down to below 30,000 ft. In fact, the conditions were so ideal for condensation that the nucleus of the contrails expanded into solid high altitude overcast.

The next morning's edition of the San Francisco Examiner contained several irate letters to the editor about the military absolutely ruining San Francisco's weather with words to the effect someone, or everyone, should be court marshaled. So much for the gratitude of the taxpayers for defending them.

I should note that mock air combat was not just between the Navy and USAF. We engaged each other and other Navy squadrons whose training had progressed to the point where they were ready to "yank and bank". One of the F7U-3s lost to stall/post-stall gyrations was out of air combat maneuvering.

The FJ-3's main deficiency was lack of fuel capacity. It held 2,200 lbs (about 340 gallons) internally which is not a lot considering it would suck up about 4,500 lbs (700 gallons) per hour at take-off thrust. Of course it would climb rapidly to high altitude where consumption was much lower so we usually did so. We normally carried two drop tanks of about 135 gallons each which gave us something over 4,000 lbs total fuel at take-off. Even with the drop tanks, every drop was precious. After engine start, the first signal was to pull the starting unit plug and immediately pull the chocks and call the tower for take-off without delay.

Launching a flight of four aircraft required four starting units and a choreographed drill by the ground crew. Pre-takeoff checks were performed on the short taxi to the runway and then we were gone. "Clean" flights without tanks were uncommon because everyone had to perform perfectly just to get airborne together. But we did a few flights for training for maximum performance. We would launch five or six airplanes with the first four to be "jumped" by the other one or two. We would all do a max performance climb and the "attackers" would pounce at 47,000 to 48,000 ft at which point only about half the original 2,200 lbs of fuel was left. After a few minutes of rousing combat we would break off at "Bingo Fuel", still at fairly high altitude due to the performance with the tanks off, and start a max range idle descent back to Moffett. "Bingo Fuel" quantity was a function of distance from home and varied from 800 down to 500 lbs. You wanted to be on the ground with 300 lbs indicated. We tried running a couple of planes on the ground to flame-out. One indicated just over zero fuel quantity and the other about 150 lbs and these airplanes were sitting still with the fuel not sloshing around. We were playing it pretty close but we never lost an FJ-3.

One of our familiarization exercises was to have the "student" do a supersonic dive. All "student" flights were chased/accompanied by an instructor in a second airplane. After all, these were supersonic swept wing jets so you had to go supersonic. The



Photo courtesy of the Boeing History Archives Office

Two Marine Corps FJ-3s, Aircraft No. 136134 and 139211, with the J65-W-2 Sapphire engine.

obvious location to do this was right over the field to "boom the base" since there was no rule or regulation against it. At 35,000 ft, the two of us would roll into a 60-degree plus dive at max power and watch the Mach indicator go past 1.0 by 25,000 ft. At this point, the student was to put in full lateral (aileron) control, roll about 45 degrees and then pull out by about 15,000 ft. This demonstrated two things. First, at high airspeeds, roll rate was significantly diminished because the ailerons twisted the wings in the direction against the roll of the ailerons. Second, that after leveling out, the wings retained enough twist (permanent set) that the lateral trim changed. You had to hold a slight amount of lateral stick in the same direction as the original roll input to maintain level flight. Having "bent the airplane" the next step was to climb back up to altitude without changing the lateral/aileron trim and repeat the exercise rolling the opposite direction to straighten out the wing twist and end up with the original trim. Surprisingly, as long as similar inputs were made in amount of aileron, rate of application, and at similar speeds, the trim would come out right on. But these were new airplanes and I have often wondered how much of this they absorbed before those wet inner wing panels started leaking.

The FJ-3 airframe and systems were pretty reliable from the start due to the F-86 and FJ-2 operating experience. However, the J-65 engine lost something in the translation from British to Westinghouse manufacture. As the squadrons at Moffet started building up to strength, flame-outs became a problem although we never had one at JTTU. There were two varieties. One kind was with no warning. Just flying along and the fire would go out. The other involved trying to accelerate the engine from a low power setting, at slower airspeeds, and having it go into a series of compressor stalls, which sometimes ended in a flame-out. Usually, if there was enough altitude, an air start was possible after a compressor stall event.

But the "without warning" variety would not relight and in some cases couldn't even maintain windmill RPM. This provoked a healthy interest in emergency systems among all of us because the flight controls (ailerons and horizontal tail) were fully hydraulic powered with no manual back-up. The airplane had an electric powered emergency pump for the No. 1 flight control system. But, since the starter-generator didn't produce electricity at windmill RPM, power for the pump was supplied by a single Ni-Cad battery.

Ni-Cad's were a new thing at the time in aircraft and the pilot's handbook was very vague about how long the battery would last after flame-out, citing a list of conditions including state of the battery charge, how much the pilot moved the controls, what airload was on the controls, etc. Bob Baldwin and I went out and picked an airplane with a charged battery (following a flight) and fired up the emergency pump. Bob sat in the cockpit moving the controls as if gliding back to do a flame-out approach. It lasted about 15 minutes. So now, would you bet your life that it would get you back to a flame-out approach and not fail at a point too low to eject? Obviously not. But at least the battery would give you time to get straight and level for an "ideal" ejection and maybe even let you glide to a more hospitable area for hiking or swimming. Later, all the aircraft were modified with a mechanically deployed ram air turbine driving a flight control system hydraulic pump which allowed flame-out approaches without loss of control.

Back to the flame out problem. Westinghouse determined that the compressor stalls were due to "production tolerances" in the compressor and fuel control. The fuel control would try to accelerate the engine RPM too quickly, causing the compressor blades to stall, just as a wing stalls. While the Navy and Westinghouse were in process of figuring out where the fuel controls should be set to insure an adequate stall margin, a temporary "fix" was directed. This consisted of taking each airplane up to 40,000 ft and doing "Bodie" engine accelerations at 5,000-foot intervals down to 5,000 ft over the runway (which is where the flame-out approach pattern started if required). A "Bodie" acceleration consisted of chopping the throttle to idle and then, with the RPM winding down and approaching idle, slamming the throttle abruptly forward to achieve maximum engine acceleration. All of this done at near aircraft stall speed. Due to the thinner air at altitude resulting in higher true airspeed and higher idle RPM the tendency for compressor stall increased as you came down in altitude.

In some cases you would get no stalls, nothing, and the airplane passed. In others, there would be a single bang and the engine might, or might not, flame-out. If it did, relight and take it home. Most of these occurred at altitudes high enough for a relight and didn't require a flame-out approach and landing. Finally, on some you would get a "machine-gun" compressor stall which seemed to occur at lower altitudes. The cockpit floor was the top of the inlet duct and the engine was effectively "coughing" air back out the duct so the stall was very loud in the cockpit.

The "machine gun" stall was truly frightening the first time experienced. Like having a heavy duty machine gun going off in your lap so fast it does 6 or 7 shots before you can yank the throttle back and recover. Surprisingly, if you were quick, it usually didn't flame out, it ran ok with more sensitive throttle movement and even more surprisingly, it didn't do any damage. Having determined which airplanes were OK and which failed, the "fix" was to remove the aft fuselages and the engines from all the failed airplanes. Then remove the fuel controls from each engine and randomly move them to another engine. Put the airplanes back together and go flight test them again. This makes no sense whatsoever but it gave us something to do and believe it or not a few passed the second time around. Why, I can't explain. And we didn't put a scratch on a single airplane playing this game.

Before the great fuel control swapping program got into swing, FJ-3s were falling from the skies over the California Central Valley in distressing numbers (some wag suggested we issue the civilian residents armor-plated umbrellas). In most cases the pilots chose to eject so the airplanes ended up as smoking holes with no chance to determine the cause.

Early on, one pilot decided to take a chance on the battery driven hydraulic pump and belly it in on the tanks on level farmland. The battery and pump did their job, but the drop tanks came off at touch down, and then when the aircraft dropped onto the belly, the barricade catcher dropped down. This was a heavy duty rod mounted between the landing gear and hinged at the back. When the tail hook was dropped to land aboard ship this thing dropped down at about a 60 deg angle and was designed to engage the cable barricades if the hook failed to catch a wire. Early experience with jets had found the cable barricades, (most ships had two) designed to stop props, sheared

off the jet's landing gear with the airplane continuing up the straight deck into "the pack" (aircraft parked forward during aircraft recovery). This tended to be very messy, so this device on the FJ-3 was designed to engage barricades even if the gear was sheared off. However on this belly landing it engaged the soft ground and flipped the aircraft over on its back right after touch-down. Fatal for the pilot and the aircraft, still damaged beyond the capability of finding the cause. Needless to say, the barricade catchers (we had another name for them) were quickly safety wired up and eventually removed.

With emergency landings pretty well discredited in the FJ-3 everyone was ejecting if they couldn't get a relight. Finally we got lucky. One fellow was climbing through 27,000 ft south of Stockton. His wingman saw a shower of sparks out the tailpipe and called that he was on fire and to exit the aircraft. Although the FJ-3 (and F-86 as far as I know) didn't have a reputation for engine fires and explosions, other types did (TV-2/T-33 and F7U-3 for example). The leader had already noted the abrupt loss of thrust, and heard the magic word "fire", so he took his wingman's advice to heart and ejected without sticking around to see how long the Ni-Cad battery would last. The airplane, instead of going unstable from the change in C.G. by loss of the canopy, seat and pilot, proceeded to glide slowly down at near landing approach speed. Then, in what must qualify as a "truth is stranger than fiction" incident, it eventually touched down gently and shed the drop tanks in a farm field before skipping over a barbed wire fence, under telephone wires alongside a road and slid to a stop in the next farm field, virtually undamaged. The clincher to this tall tale would be that the pilot came drifting down in his chute and landed in the cockpit. Hah! Not quite. I think the pilot was down before the airplane because he free fell to well below 10,000 ft and landed miles from the airplane.

But believe it or not, here was an intact airplane. The flameout cause was failure of the "H" bracket which supported the top of the engine gearbox. The gearbox was driven by a shaft that ran down to the bottom of the engine. The gearbox was supported at that point and then shaped to wrap up around the right side of the engine with the starter-generator, hydraulic and fuel pumps and fuel control all mounted on the aft side. The "H" bracket held the top of the gearbox up to the right side of the engine compressor. When the legs of the "H" collapsed, the gearbox fell out against the inside of the engine bay; thereby, binding and/or shearing the drive shaft resulting in engine failure. The failure modes varied somewhat depending on power setting, "G" load of the aircraft and who knows what else. In any event, the fix was to simply strengthen the "H" bracket.

With the gearbox bracket problem solved and modified fuel controls coming through the supply system, the FJ-3's future was looking up at the end of 1955. But my time at VC-3 was up and I had orders to NASWF (Naval Air Special Weapons Facility) at Kirtland AFB in Albuquerque, NM. It was back to "The Bomb" business for me. But it wasn't all bad. There, I became the assistant project pilot on the NAA FJ-4 Fury which was my favorite airplane until I encountered the NAA RA-5C Vigilante years later at NAA Columbus. That is another story that will have to wait for another day.

About the Author: Archie joined the Navy at the start of the Korean War. His first overseas tour was in a Douglas AD-4 Skyraider aircraft on WWII era straight deck carriers. His last tour was in McDonnell F-4 Phantoms on the USS Kitty Hawk, which was the first overseas tour for both Phantoms and the ship. In 1965, he joined the Columbus Division as an engineering test pilot and in 1972 was promoted to Manager of Flight Operations. He flew the RA-5C, T-2B, OV-10, T-28, the Missile Systems Division F-4 and A-6 as well as the Columbus Division executive Twin Beech. He also "flew" the tethered XFV-12A VSTOL aircraft in the NASA Langley test gantry. In 1981, he transferred to the Los Angeles Division and, subsequently, became the IR&D Program Manager. He retired in 1990 and for three years was a commuter airline captain for Air LA operating between the Southwestern U.S. and Northern Mexico. Arch and his loving wife, Robbie, reside in Cypress, CA and periodically tour about the U.S. in their 1943 Beech Staggerwing.

Congratulations and Best Wishes to

Irwin and Shirley Altnue of La Mirada, California
celebrating their 56th Wedding Anniversary

Warren and Maxine Bratfisch of Mesa, Arizona
celebrating their 65th Wedding Anniversary

Harry and Alice Desko of Kansas City, Kansas
celebrating their 65th Wedding Anniversary

Charles and Mildred McKim of Clifton, Colorado
celebrating their 65th Wedding Anniversary

Richard and Gloria Stephenson of Crestline, California
celebrating their 50th Wedding Anniversary

Charles and Katy White of Spring Valley, California
celebrating their 68th Wedding Anniversary

Solving the F-100 Electrical Power Issue

by Warren Helsley

During the 1950s the F-100 was one of the first aircraft to transition from direct current (DC) electrical power to the lighter more efficient alternating current (AC) electrical power. In order to use AC power effectively, it was necessary that the generator (AC) output shaft speed and, hence, its output frequency (400 cps) be maintained within very narrow limits under all aircraft operating conditions. This was the basic function of the Constant Speed Drive (CSD). Thus, it was necessary that, regardless of aircraft altitude, attitude, G loading, or operating temperature, the CSD had to be capable of converting the variable speed (rpm) derived from the jet engine to an uninterrupted constant speed at the generator output. The CSD used at that time was basically a variable displacement pump back to back with a hydraulic motor. By varying the output displacement of the hydraulic pump appropriately, variations in input speed could be made up and, at the same time, variations in output load could be offset while maintaining the desired output speed.

A 2004 article in the bulletin mentioned the fact that the CSDs installed in the F-100 aircraft had problems of intermittent and frequent loss of AC frequency control. These interruptions, in turn, degraded the flight instrumentation and navigation systems of the aircraft and became a serious safety of flight issue. These early CSDs were tied into the engine oil system. It was concluded that the engine oil system was the primary source of the CSD problems. The engine oil system tended to be dirty, traced to varnishes formed after engine exposure to high engine temperatures and tended to experience the intermittent air "gulping" inherent to the engine's oil scavenge system. The CSD did not tolerate the entrained air kindly. It needed solid oil in the pump motor circuit.

Therefore, it was decided to provide an independent oil system for the CSD that circulated oil through its own reservoir. The separate oil system made a marked improvement in CSD performance; however, it did not solve all of the problems.

When the aircraft flew inverted and/or pulled zero or negative Gs, the electrical power system would still suffer loss of AC frequency control. The problem was that, for power transmission efficiency, the CSD was a scavenged dry sump design that necessitated an air/oil reservoir to service it. With such a reservoir design, under other than positive Gs, the fluid (oil) would tend to move around to the top or sides of the reservoir uncovering any fixed suction port. While it was uncovered, the suction port would "gulp" air. Various fixes were proposed such as the "rotating hopper" or the so-called "limber dick" designs, neither of which could consistently follow the oil around the reservoir, particularly when operating near zero "G". It shortly became apparent that an additional "fix" was needed and this is where the "All Attitude Reservoir" came in.

Without going into the overall oil system schematic it is sufficient to say that the All Attitude Reservoir design was based on, and took full advantage of, a unique characteristic of the hydro-mechanical CSD. This was, that throughout its variable input speed range the CSD had a nearly constant circulating flow rate. This occurred because the majority of the circulating flow was generated by the so called "charge pump" which was driven at a constant speed by the CSD output shaft. Using this unique characteristic, the All Attitude Reservoir was designed to deliver a constant supply of de-aerated oil to the oil suction line in all reservoir attitudes and over the range of airplane "G" loads normally experienced. Best of all, it did all this without the need for any moveable parts (i.e., such as rotating hoppers).

The reservoir and its functioning elements are shown pictorially in Figures 1 and 2. The reservoir was designed to be filled such that the total reservoir volume was apportioned approximately as follows:

1) 50% oil below baffle (6)
2) 20% oil above baffle (6)
3) 30% air above baffle (6)

After operation started, an air-oil mixture entered the inner swirl chamber at a high velocity through the tangential inlet (5). The resulting swirling action created an induced vortex that was truncated at the top and bottom by the outer swirl chamber (3). The air, entrained in the entering oil, having a much lower density then the oil itself, moved to the center of the vortex as a result of centrifuging action. Thus, in effect, a cylinder of rapidly rotating oil was formed with a core of air at its center.

As more air was added, by the incoming oil-air mixture, the air already in the core moved up and out of the swirl chamber (3), through the normal separated air outlet (2) into the chamber above baffle (6). For the purposes of this discussion, this chamber above shall henceforth be designated as the "air side" while the chamber below baffle (6) shall be known as the "oil side". The air moved on through the "air side" chamber and out the vent port (11).

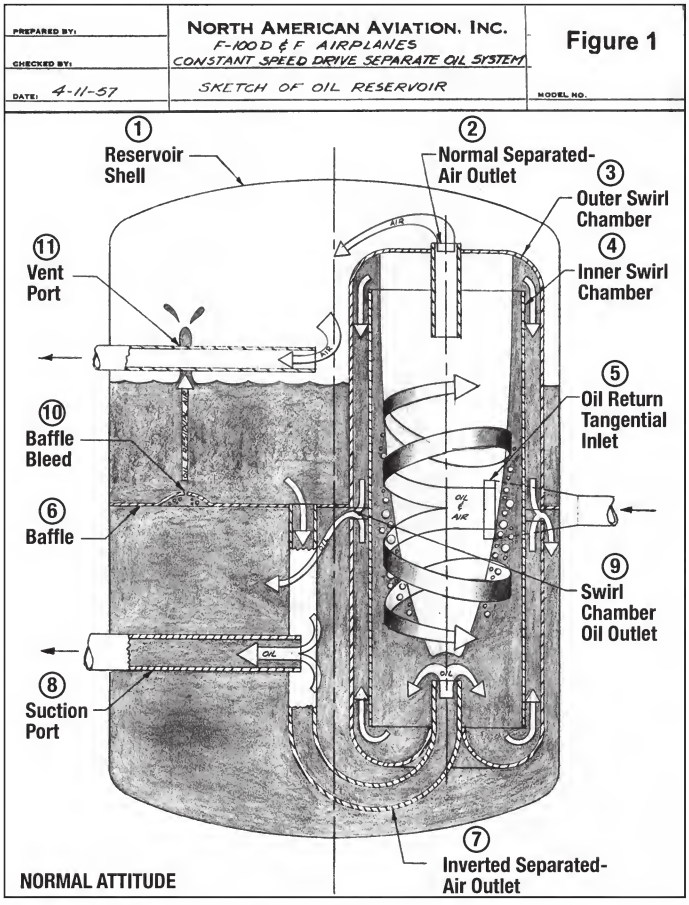


Figure 1. Sketch of CSD Oil Reservoir in normal attitude

The inner swirl chamber (4) was formed by a piece that was essentially an open-ended tube. As more oil was added to the vortex, the de-aerated oil flooded over the top, and swirled under the bottom of the inner swirl chamber (4) and continued swirling in the annular area between (3) and (4). Gradually the swirling action was damped as the de-aerated oil moved to the swirl chamber outlet (9) and part of the total energy in the vortex was converted to a relatively high static pressure. Oil outlet (9) communicated with the "oil side" of the baffle. This chamber tended toward a low static pressure as a result of the constant oil removal through suction port (8), partially offsetting the vortex generated high pressure.

Suction port (8) was actually routed to the center of volume on the "oil side" and the vent port (11) was routed to the center of volume on the "air side". Baffle (6) was punctured by one or more baffle bleed holes (10). This was necessary because the oil entering the "oil side" chamber would always have some residual air in it. This air would constantly settle out during its "dwell" time in the "oil side" chamber. The bleed holes were provided to allow this air to reach the "air side". The removal of residual air was indirectly assisted by the inverted separated-air outlet (7). In normal flight attitudes, outlet (7) was submerged under a static head of oil created by the 20% oil above the baffle. As a result an auxiliary circuit was established in which oil flowed down outlet tube (7) into the bottom of the swirl chamber. There it was entrained in the vortex, was pumped out outlet (9), packing the "oil side" chamber, and emerged up through bleed holes (10), carrying the residual air with it.

During inverted or negative "G" operation the performance of the de-aeration cycle remained largely unchanged (see Figure 2). The aerated oil still entered at high velocity through inlet (5). It still swirled in, de-aerated and flooded over both ends of the inner swirl chamber (4) and was still pumped out as relatively air free oil to the "oil side" through outlet (9). However, since the reservoir was now inverted, the oil and air on the "air side" now changed places. Outlet (7) was now open to air and outlet (2) was now submerged under a static head of oil. The separated air found its way to the "air side" through the outlet tube (7) and oil entered through normal outlet (2), was entrained in the vortex and was pumped up to the "oil side".

In the meantime, oil was bleeding through the residual oil bleed (10) from the "oil side" to the "air side". Almost immediately however, an equilibrium was established in which the oil pumped up through (2) and out (9) equaled the oil bleeding through (10) and inverted operation could be maintained indefinitely.

When the reservoir was operating on its side, or in any other intermediate attitude, performance was essentially the same except that air left the vortex by whichever of the two outlets (2) or (7) offered the least resistance and oil entered to be pumped to the "oil side" through the other outlet. The reservoir, when it was designed and built, performed as predicted in laboratory tests and, subsequently, in flight tests. The reservoir was patented by North American (NAVAN) and licensed to Sundstrand the primary supplier of CSDs in that time period. The reservoir proved to be a godsend to Sundstrand. It bailed them out of the serious reliability problems they were having with all their CSD installations.

As an example of the reliability improvement which could be expected; in a five-month period when the all attitude reservoirs were retrofitted on the F-100D and the F-100F aircraft, the

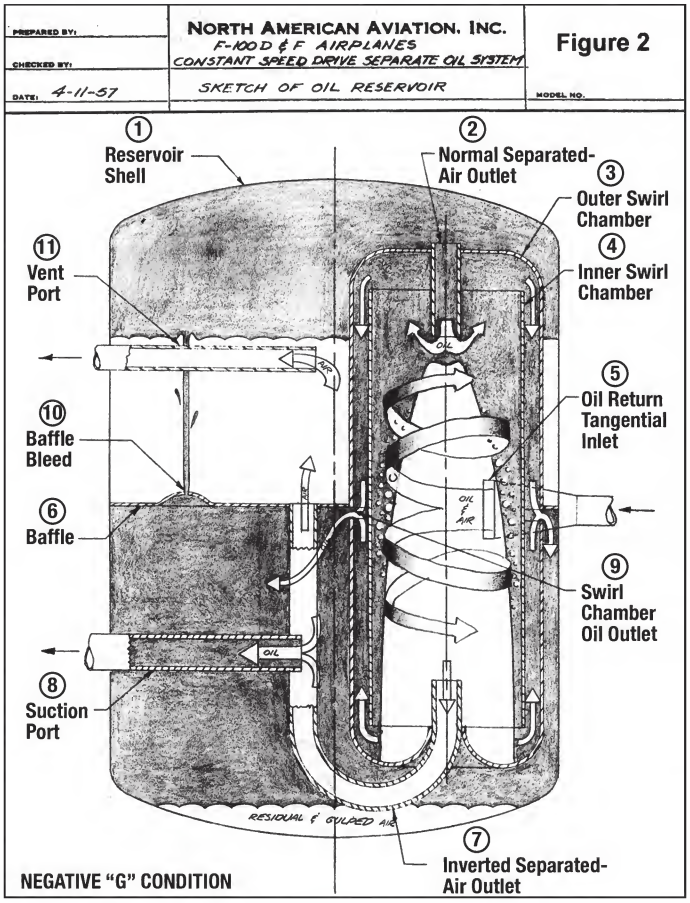


Figure 2. Sketch of CSD Oil Reservoir while in Negative "G"

reliability improved tenfold dropping from 4 malfunctions per thousand flight hours to 0.4 malfunctions per thousand flight hours. By the end of the first year, the malfunction rate was down by an additional factor of two to 0.2 malfunctions per thousand flight hours. The reservoir was used on a majority of all Sundstrand CSD installations during the late 1950s and early 1960s. These included, in addition to the F-100 series aircraft, such aircraft as the North American F-108 and the B-70, the Convair F-106, the Grumman WF2, and the Boeing B-52 and 707. Although military aircraft did not involve royalties, the royalties being paid for the 707 by Sundstrand were so great that they tried everything they could think of to get around the patent. Finally, in the mid-1960s they succeeded. While maintaining the vortex principal, they built a rotating swirl chamber-hopper into the CSD itself, which was considered a sufficient change in approach to abrogate the patent.

About the Author: after a two-year stint at Douglas Aircraft and two years as a lieutenant with the Army engineers during WWII, Warren designed fuel injectors and fuel flow control equipment at General Motors. Earning his degree at the University of Kansas, he joined NAA in 1952. With the exception of an 18-month assignment at Boeing as an "industry assist" on the 757 and 767 aircraft, he served the next 31 years at LAD in the hydraulic system design group. During that time, he held leadership positions, authored sixteen technical papers and was issued five patents, including one that is the subject of this article. Leaving NAA/Rockwell, he dedicated the next twenty years to a successful consulting business in the hydraulic and power systems fields. He is retired now and lives with his lovely wife Pat in Shelter Cove in northern California.

To Snatch a Sabre

by Ralph Wetterhahn

The U.S. Air Force was able to determine precisely how the Soviet-built MiG-15 compared with its own premier fighter, the North American Aviation F-86 Sabre, because on September 21, 1953, two months after the cessation of hostilities in Korea, North Korean Lieutenant No Kum-Sok defected, flying his MiG-15 to Kimpo Air Base in South Korea. The next day, the Air Force lifted the MiG to Okinawa and sent two test pilots—Major Charles Yeager and Captain H. E. Collins—to take its measure. During 11 test flights, the two pilots answered the question that is still being asked 50 years later. Which is better, the Sabre or the MiG?

At the start of the Korean War, the F-86 was the fastest airplane in the world. Its maximum speed was a blistering 685 mph. The MiG, at 670 mph, was not far behind. The Sabre had higher roll and turn rates than the MiG. But the test pilots found that the MiG had better acceleration, could climb faster, and could fight at a higher altitude.

With two-23 mm and one-37 mm cannon, the MiG packed a harder punch than the Sabre's six-.50 caliber machine guns. But the Sabre had sharper aim. Its AN/APG-30 radar gunsight gave its pilots the advantage in ease of use and accuracy. The Soviets had learned all this before the Americans did. They had conducted comparisons of their own, thanks to a rare combination of circumstances and a focused opportunism.

Although U.S. Air Force Second Lt. Bill N. Garrett didn't know it at the time, the MiG-15 that took him out of the fight on October 6, 1951, was flown not by a North Korean or Chinese pilot, but by a Russian. The MiG pilot had hit Garrett's F-86A behind the cockpit and had damaged his J-47 engine and ejection seat. As Garrett struggled westward toward the Yellow Sea, where he planned to ditch and, with luck, get rescued: another MiG pilot spotted his stricken aircraft. This pilot too was Russian.

Captain Konstantin Sheberstov was patrolling in a formation of four when he spotted easy prey: a lone wounded F-86. He remembered the incident 45 years later, "This F-86 was descending at an angle of 45-50 degrees with black smoke trailing. I started chasing him at maximum speed. I caught up with him at an altitude of 3,300 feet and from a distance of 1,000 feet opened fire…" In trying to evade his pursuer, Garrett lost more altitude and was barely able to reach the mud flats along the coast, where he ditched the airplane. Here on October 6, 1951 the Russians were presented with the trophy they had been trying to snare for months.

In the month before the first F-86s got to Korea, MiGs ruled the sky. Although World War II F-51 Mustangs were holding their own, they were no match for the Russian-built jets, and the U.S. straight-wing, Republic F-84s and Lockheed F-80s, were almost 100 mph slower than the MiG-15. But in December 1950 the Sabres arrived. They had barely joined the war when they shot down six MiG-15s in a single engagement on December 22.

The Soviets immediately set out to learn everything they could about the new enemy fighter. In the months that followed, Soviet intelligence agents monitored F-89 radio frequencies, interrogated Sabre pilots who had been shot down and taken prisoner, and reported their findings to the Soviet leadership. Premier Joseph Stalin himself gave the order to capture an F-86.

In April 1951, the Soviet Central Aero-Hydrodynamics Institute, a flight research center located at what is today Zhukovsky Airfield near Moscow, dispatched a special group of test pilots to a training base in Manchuria. The team practiced precision



Photo from the Larry Davis Collection

Ground crew examines enemy damage to a 4th Fighter Interceptor Wing F-86A Sabre which returned with it's entire left aileron missing.

formation flying in MiGs, with the outlandish goal of boxing in an F-86, escorting it to Manchuria, and somehow forcing it to land. After a month of practice, the pilots joined the 196th Fighter Air Regiment, part of the 324th Fighter Air Division, at Andun, on the Manchurian side of the Yalu River, which formed a border between China and North Korea.

Experienced combat pilots of the Soviets' highest scoring regiment in Korea, the 196th made fun of the plan. The regimental commander, Colonel Yevgeniy G. Pepelyayev, derided the test pilots. The test pilots wanted to fly MiG-15s assigned to his regiment and offered to let the 196th count test-pilot victories as their own. Although Pepelyayev relented and allowed the use of his airplanes, he told them, "I don't need your victories and won't have any. You will be lucky if you manage to stay alive." The test pilots achieved no victories. During their first combat experience, on May 31, 1951, one of the senior test pilots was shot down.



Photo from the Larry Davis Collection

Pilot of NAA F-86E-10 Sabre, Aircraft No. AF 51-2790, of the 51st Fighter Interceptor Wing "Checkertails" releases fuel tanks on approaching MiG Alley over the Yalu River.

After their commander died in a crash landing at Andun airfield within weeks of the first loss, members of the group were spirited back to Moscow. Five remained and were absorbed into combat units, but the plan to corral a Sabre was quietly dropped.

Then on October 6, Bill Garrett bellied into a tidal pool on the coast of the Yellow Sea, and the Russians saw their chance.

Garrett was rescued by an SA-16 amphibian, but above his F-86 a three-hour battle raged as U.S. pilots tried to destroy the aircraft and Russian pilots fought them off. The Russians paid dearly for the prize. "We lost seven MiGs and didn't get anymore Sabres," Pepelyayev said, "but the incoming tide covered the plane."

A Russian search team, which included Moscow representatives of the Mikoyan design bureau, used the MiG pilots' reports to locate the aircraft. Knowing it was only a matter of time before the Americans returned, the search team recruited 500 Chinese laborers to haul the wreckage from the water. The next day, as the team members labored to remove the wings, they had the advantage of an overcast sky, but U.S. ships at sea spotted the group and fired on them. An F-84 dropped through the clouds, causing the workers to scurry for cover on the levee, but the F-84 turned out to be a reconnaissance version and had no bombs to drop on the aircraft. That night, desperate to depart before dawn, the team continued to dismantle the Sabre, finally finishing at four in the morning. The laborers loaded the pieces on trucks. Rolling toward Andun, the convoy hid in tunnels during the day, hopping from one to the next each night, yet the prize was nearly lost. One of the military engineers, N. M. Chepelev, rode in the lead truck, which carried the F-86's forward fuselage. Even though daylight was fast approaching, he decided to attempt to reach the next tunnel. The rest of the group elected to play it safe and stay behind. The Americans "almost got us," Chepelev remembered. "The driver… was already approaching the tunnel when we noticed the 'night watchman'—a B-26… We entered the tunnel at high speed as the B-26 fired several rockets at us. Fortunately, we were already about a hundred meters deep inside the tunnel, and the rockets could only penetrate for about 10 meters before hitting the walls."

Eventually, the convoy got its prize to Andun. The design group wanted the Sabre sent immediately to Moscow, but Pepelyayev persuaded the team to leave it at the base for a few days. "I sat in the cockpit. We all did," he said. "It was a well-laid-out cockpit, which created an impression that you were sitting in an expensive car." When the aircraft was finally sent to Moscow, Pepelyayev recalled, someone sent back a complaint: "Couldn't you have washed the mud off the aircraft before sending it to us?"



Photo from the Larry Davis Collection

F-86E Sabres of the of the 51st Fighter Interceptor Wing "Checkertails" on the flight line at Suwon, South Korea in Summer 1952.

The captured Sabre, Serial Number 49-1319, arrived at the Air Force Research Flight-Test Institute at Zhukovsky, 22 miles southeast of Moscow, in October 1951. Stalin knew that getting his hands on a Sabre would permit Russian engineers to copy and modify parts for fighter aircraft in a fraction of the time it would take to develop improvements from scratch. His intention had been to have the F-86 copied by an aviation design bureau, just as he had done with the B-29 after three of those aircraft had made emergency landings in Vladivostok during World War II.

But the inspection team at Zhukovsky, led by the highly respected test engineer Major Semyon Fradkov, concluded that the copying effort wasn't necessary. Engineers from the Mikoyan, Yakovlev, Tupolov and Sukhoi design bureaus also examined the Sabre, and noted in their evaluation that the MiG-15 already was a good match for the F-86 and that the MiG-17, about to go into production was more advanced.

According to Yakovlev's Eugenji Adler, only one engineer dissented: V. V. Kondratyev, from the Central Aero-Hydrodynamics Institute. For his trouble, Kondratyev was tasked with the project of reverse-engineering the Sabre, but the design bureau that was to be created for the purpose never came to be, the effort lost among the many projects jockeying for attention and funding in the final years of Stalin's regime. Stalin died in 1953.

Meanwhile, the Air Force Research Flight Test Institute proceeded with its analysis of the F-86's systems. A team of engineers removed each item and measured, photographed, and drew wiring and engineering diagrams of it. One of the systems that most interested the Russian engineers was the gunsight. Senior Lieutenant Vadim Matskevic, who worked in the air force engineering department, got the job of comparing the F-86 gunsight system with the one on the MiG-15.

The F-86 had a Sperry APG-30 radar gunsight, which was extremely accurate up to a range of about 3,000 feet and able to measure the range and compute the lead time required even while the target was maneuvering. The MiG-15, on the other hand, had a manual system that had been designed in 1939. In Korea, many Sabre pilots credited their gunsight with the advantage they had over MiGs. Matskevic said as much in his report, concluding that the F-86 sight was better than the Soviet design. But questioning a decision in Stalinist Russia—the decision in this case, to field a fighter with an inferior system—was a dangerous business. Matskevic's opinion earned him some 30 denunciations from other engineers. Matskevic worked feverishly to develop a counter to the F-86 gunsight. He designed a warning system that detected the signal from the Sabre's gunsight and alerted the pilot that his aircraft was reflecting the signal back to the pursuer. Based on the same technology as applied in today's police radar detectors, the system was a simple receiver mounted on the tail of the MiG.

Flight testing of the device became the chore of Lieutenant Colonel Stapan Mikoyan, nephew of the renowned Mikoyan-Gurevich Design Bureau chief, Artem I. Mikoyan. Mikoyan had fought in Moscow and Stalingrad during World War II. He then attended the Zhukovsky Air Force Academy in Moscow, graduating with honors in 1951 to become a test pilot at the Research Flight-Test Institute.

One of Mikoyan's responsibilities was testing Sabre systems and avionics. He and test pilot Igor Sokolov tested Matskevic's warning device. To prove his concept, Matskevic set up the radar

emitter from the captured Sabre on the roof of one of the institute's tall buildings and mounted his warning device on a MiG. Every time Mikoyan and Sokolov flew the MiG over the building, "We heard a low-pitched 'howling' in the earphones," Mikoyan recelled. "As the distance from it grew, the noise became higher in pitch, but lower in volume. Even so, it remained perfectly distinct within seven or eight kilometers."

In May 1952, Matskevic took 10 sets of his new invention to Korea and began installing them in MiG-15s. It took about three hours to complete each installation.

Because it occasionally gave false warnings, pilots initially distrusted the device. Many just turned it off, Matskevic said. But he was soon vindicated. A regimental commander flying over the Yalu heard the device give off a faint tone. He checked his six o'clock position and saw nothing. The tone grew louder, so the pilot craned his neck around to look again. Still nothing. He decided the system was acting up, so he shut it off. A minute later, feeling uneasy, he turned it back on. Now the tone was howling. He looked back in time to see two F-86s closing to gun range. As the Sabres opened fire, the MiG pilot banked sharply and escaped with only minor wing damage. From that point on, the word spread. "We saved a lot of pilots," Matskevic said.

The system also saved Matskevic's career. He received the Soviet Red Banner, awarded for meritorious service, and a tribute from North Korea. His warning device and its derivatives became standard equipment on all Soviet fighters.

As more components from the captured F-86 were removed and cataloged, they were installed on test bed aircraft at the Soviet test institute. As a result of the evaluations, several conducted by Mikoyan, the Soviets modified their existing fighters and incorporated some features into future models. The MiG-15bis, for example, already in production, was given a larger speed brake and new hydraulic systems to operate the elevator and ailerons. The larger brake and aileron boost system were also incorporated into the MiG-17. The small accelerometer, for measuring G forces, was adopted and installed on the MiG-19 and follow-ons.

While work on the F-86A continued in Moscow, an F-86E, Serial Number 51-2789, flown by World War II ace Walker H. Mahurin, was downed in Korea by flak in July 1952. Mahurin, then a wing commander, crash-landed. He sustained a broken wrist and was captured and remained a prisoner until just after the armistice in 1953.

His aircraft, though it was in worse condition than Garrett's F-86A, was recovered and dismantled, and the parts were sent to Moscow. The evaluation of it's systems were conducted after the war.

In the F-86A model, cables connected to the hydraulic actuators moved the control surfaces, but the -E eliminated the cables in favor of a completely hydraulic system for operating control surfaces. The -E also used an all-moving horizontal stabilizer. The combination improved maneuverability at high speeds without the need for trim tabs. Artificial feel was built into the aircraft controls using weights and bungee springs, which let the pilot feel normal stick forces that were still light enough for superior combat control.

A prototype of the MiG-17, dubbed SI-10, was selected to evaluate the features of the new F-86E models. After the design bureau test pilots made several flights at Zhukovsky airfield, Mikoyan ferried it to the Chkalovskaya airfield and in June 1955 began testing it. One of the F-86E's modifications included the leading edge flap system. "The leading edge flaps improved maneuverability to some extent but they were not adopted, I think because production of the MiG-17 was ceasing then," Mikoyan stated. "They were not used on the MiG-19 either, probably because of the greater sweep angle, almost 60 degrees, of its wings."

The fully movable stabilizer was also tried on the MiG-17. When Mikoyan flight tested it, at a three G load factor, he let go of the stick to test the aircraft's dynamic stability. He expected the MiG to porpoise slightly and return to stable flight, but he got a surprise. "The aircraft pitched down so sharply that I was tossed up from my seat and bumped my head against the canopy," he said. "Then it pitched up, and I was pressed down into the seat. After a series of such violent and hardly bearable jolts, I finally decided to get hold of the stick, and the aircraft steadied down. My head was booming like a church bell and ached—I was only wearing an ordinary leather helmet. When the instrument readings were studied afterward, it turned out that there had been nine up-and-down jolts in eight seconds, with the positive load pressing me into the seat-up to 10 Gs and the negative up to -3.5 Gs."

Mikoyan borrowed one of the three U.S. "crash helmets" recovered in North Korea and flew a second test. "The whole thing happened again, the only difference being that my head did not ache quite as much," he said. The stabilizer modification, Mikoyan added, was not adopted for the MiG-17. However, the all-movable stabilizer was installed on the MiG-19 and later Soviet fighters.

One of the most significant adaptations the Soviets made after capturing the Sabres and Sabre pilots was the introduction of G-suit systems, which enabled Russian pilots to handle the increasingly formidable MiG and Sukhoi fighter jets to come. With the addition of G-suits, the Soviets improved the performance of the most lethal system in a combat aircraft: the pilot.

About the Author: A freelance writer and NOVA documentary presenter, Ralph Wetterhahn has become a real life "Indiana Jones", traveling the world from Cambodia to the Russian Far East, to Guadalcanal, and to the Phillipines in search of aircraft wrecks, our nation's missing-in-action and the amazing stories that his discoveries reveal. Widely read in Air & Space/Smithsonian, Military Officer Magazine (MOAA), Leatherneck, and VFW Magazine, among others; he is the author of three books. Ralph served two combat tours flying fighters in both the USAF and the Navy during the Vietnam War and is credited with downing one MiG-21.

BOOKS AUTHORED BY RALPH WETTERHAHN

The Last Battle – winner the 2002 Colby Award, recounts the Mayaguez incident and the final combat of the Vietnam War

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These books are available at major bookstores, at Amazon.com or Barnesandnoble.com.

Author signed copies may be obtained through the author's web site at: *www.bomber31.com.* They make great gifts.

Contrails From The Past

by Ed Rusinek

Dear Ed,

Enclosed is my renewal check. The bulletin sure brings back memories of my days at NAA/LAD. I started to work at El Segundo in 1940, was assigned to Department 1 and had Badge No. 745. At 89, I still recall those days fondly.

—Paul R. Stuck, Santa Ana, CA

Ed's Ans.: Thank you Paul for reminding us of the time when we were assigned badge numbers based on the order when we were hired. Are there any lower numbers out there?

Dear Ed,

I enjoyed reading the Winter Issue-but was surprised to read that my wife and I have been married for 25 years. I am sure that since we are both 91 years old and have been married over 68 years there must have been some mistake. In case any of my peers are still living, it would be nice if you would make a correction-large enough that they might notice it.

—Charles E. White, Spring Valley, CA

Ed's Ans.: Dang, Charlie! You and Katy are so good looking, it is hard to believe that you are 91 years young! Our very best wishes to you both on your 68 years of wedded happiness.

Dear Ed,

In 1956, I was hired as a chemist to manage the X-15 propellant and pressurization system design. The following year, I was asked to also design the fuel system for the XB-70. Since the airplane was to perform almost like a fighter aircraft at very high altitudes and at speeds over Mach 3; the fuel was subject to temperatures that exceeded its flammability limits, and auto-ignition was a real possibility.

The use of a new high-energy fuel, toxic in nature, precluded using an open venting system, such as used in other jet fueled aircraft at the time. So I created a closed vent system, and added a liquid nitrogen source for distribution of the pressurized gas into the fuel tanks to replace the oxygen. I was firmly convinced that such a drastic step was needed to prevent ignition of fuel vapors and presented this to management. To my astonishment, all of management agreed and told me to "get to work!" This was the philosophy used by all NAA management throughout my tenure, always supportive and expecting results.

Adding a pressurized system posed many technical issues for the structure group and they added numerous vertical panels into the wing tanks to accommodate the design. I, in turn, cut numerous holes into these panels. This made me very unpopular to say the least. George Patterson and I developed a small fuel system test at the abandoned NAVAHO facility and verified that auto-ignition could occur, although we only got one explosion in about 15 different tests.

In performing the design analysis needed to establish the system configuration, I was granted virtually unlimited access time to our company computer; each run taking over eight hours to complete. I ran hundreds of conditions to verify operation within the entire spectrum of the flight envelop. Some of these calculations were even coupled to Rocketdyne and Columbus.

The inerting system was installed and flight tested at Edwards AFB and worked without any problem. Unknown to me at the time, several other subcontractors picked up on the need for aircraft fuel safety and conceived some stop-gap systems and programs such as: jelled fuels, open-celled foam, rubber bladder tank inserts, fuel vent system spark arrestors, ignition detection and extinguishment, crash tests, and fuel-oxygen concentration tests.

The commercial aviation industry generally has fuel tank vents at the wing tips, which invite static buildup and are a potential source for lightning strikes. NAA used vent system exits at the tail of the aircraft, precluding explosion from a lightning strike or static buildup.

Several years ago, after I left NAA, I tried to get Boeing, the FAA, ALPA, the SAFER Committee and the Commercial Airlines to incorporate the liquid nitrogen system, but, alas, it was firmly rejected. Ten years ago, TWA Flight 800 exploded after takeoff. This past summer, on the 10th Anniversary of this horrendous mishap, the FAA concluded that the explosion was 100% caused by ignition of fuel vapors in the center wing tank due to a faulty electrical wiring system. Interestingly, in the design of the XB-70 in 1957, I never allowed electrical connections or wiring in the tanks and used hydraulically driven fuel pumps capable of operating dry without any danger of overheating. Boeing and others are currently incorporating onboard nitrogen inerting systems to accomplish the same task.

All of this attention I have dedicated to aircraft safety was due to the keen commitment years ago by the NAA managers to assure that their products were the best. For that I am eternally grateful.

—Cleve C. Kimmel, Billings, MT

Ed's Ans: Phew! Cleve, you certainly know how to get our attention! I think we just discovered another great author in you!

Dear Ed,

I found the article by Jim Albaugh most interesting. I participated in three of the five of the "moments in history" eras as a propulsion systems engineering supervisor:

World War II: O-47, B-25 at LAD, P-51, T-6, B-24 at Dallas
Jet Age: YF-93, F-100, B-70 at LAD
Space Race: Apollo, Space Shuttle at Downey

Although retired, I find it most interesting to follow the fifth era. Your publication does an excellent job of presenting this view of the future.

—Warren "Pat" Bratfisch, Mesa, AZ

Ed's Ans.: Thank you for the kind word, Warren!

IF YOU THINK OF GOD AS YOUR COPILOT MAYBE YOU SHOULD SWITCH SEATS!

The Silent Majority

by Stan Guzy

TAYLOR, KENNETH M., 86 – an Army Air Corps pilot, Lt. Taylor joined Lt. George "Wheaties" Welch to become the first two U.S. pilots airborne during the Japanese attack on Pearl Harbor on Sunday, December 7, 1941. The 47th Pursuit Squadron pilots had attended an officers' party the night before when they were awakened in their quarters by explosions as Japanese planes bombed Battleship Row and nearby airfields. Taylor threw on his tuxedo pants and with Welch drove the ten miles to Haleiwa airfield where their P-40 fighters were parked. Within minutes they were airborne with guns blazing. Neither was recommended for the Medal of Honor because they did not wait for orders from their commanding officer to take off. Taylor had homes in Anchorage, AK and Tucson, AZ. He is survived by his wife, Flora.

BLACK, RUTH, 88 – died from a stroke on January 11, 2007 in Bullhead City, AZ. Ruth was the widow of John Black. They both worked at LAD for many years, he in Manufacturing and she in Planning.

BLANCHET, CLEO E., 89 – passed away on December 25, 2006 at his assisted living home in Chino, CA. A graphic artist and technical illustrator, Cleo worked for many years at NAA/Rockwell. He is survived by his wife Elena.

CECKA, WILLIAM J. "BILL", 85 – died in Saratoga Springs, NY on December 22, 2006 after a long illness. He joined NAA in 1943 but was inducted into the service in 1944. He returned to NAA in 1946, resuming his work on the new science of rocketry. With initial field testing being done in the LAD parking lot, subsequent testing was moved to the Santa Susana Mountains. Bill was a key member of the teams that developed and built engines for the Atlas, Thor, Jupiter and Redstone rockets as well as the J-2 engines for the Saturn V rocket. He retired in 1977 as president of the Rockwell Tulsa division. He is survived by his wife Ethel.

CINDRICH, JOSEPH J., 68 – succumbed to cancer at his home in Fort Smith, AR on August 1, 2006. Joe implemented test plans at Space Division for major components until he was transferred to Vandenberg AFB where he participated in construction of a launch facility. He is survived by his wife Louise.

DILLOW, ROLLA M., 90 – died at home in Apple Valley, CA on January 6, 2007. Rolla served in Personnel at NAA/Rockwell for 31 years. He is survived by his wife of 65 years, Aileen.

FLESIA, TERRY, 66 – died of lung cancer at his home in Irvine, CA on December 6, 2006. Terry joined NAA in 1961 in the tooling department in Downey. A year later, he transferred to Traffic & Transportation where he had a variety of assignments from forklift operator to assistant supervisor. He is survived by his partner Pam Lessin.

FOERSTER, ARTHUR R. "RICK", 85 – of Elizabethtown, PA, passed away on November 16, 2006. Arthur started at NAA as a field tech representative and later became a contracts administrator at LAD. He retired in 1981 with 26 years of service. He is survived by his loving wife Joyce.

GIMMA, FRANK, – of Las Vegas, NV passed away on May 29, 2006. Frank retired from Space Division in 1997 after 33 years of service. He is survived by his wife Mary.

GRIFFITH, KERMIT L., 74 – died at home in Rogue River, OR on September 16, 2006. Kermit served in Quality Assurance for 29 years before he retired from Space Division in 1992. He is survived by his wife Marcella.

GRUSD, JACK, 91 – of Victorville, CA died on August 25, 2004 from undisclosed causes. Notified by Doris Grusd.

HERRING, LEIGH L., 86 – passed away on December 21, 2006 in Long Beach, CA. Leigh served in the Navy, Coast Guard and Merchant Marine for many years before joining Rockwell International. He received a NASA Outstanding Achievement Award for his work on electrostatic sensitive electronics. He is survived by his wife Helen.

HOFFMAN, LOUIS V., 87 – a long time resident of Prescott, AZ, Lou slipped the bonds of earth and closed his log book on January 19, 2007. Lou joined NAA at Kansas City, KS in 1941, building B-25s. He enlisted in the Army Air Corps and received flight training at RAF Flying School #4 at Falcon Field, Mesa, AZ where he proudly received USAAC and RAF wings. During WWII, he flew as a ferry and VIP pilot. After the war, he worked at several aerospace companies including a stint at Autonetics, testing Navaho inertial navigation equipment. He was an Associate Fellow of the Society of Experimental Test Pilots and a charter member of the Aviation Hall of Fame. He is survived by his wife Dava.

KOLB, GEORGE N., 69 – died November 19, 2006 in Escondido, CA. Although George retired in 1998 from Space Division after 35 years of service as a mechanical engineer, he also had assignments at Palmdale and on the Sabreliner. He is survived by his loving wife of 46 years, Cynthia, of the Rincon Indian Reservation.

KRASINSKI, HENRY L. "HANK", 80 – passed away in Westerville, OH on January 24, 2007. Henry started his career at Curtiss Wright in Columbus and eventually retired from Rockwell International after 25 years of service as a mechanical engineer.

LACROIX, WILLIAM P., 80 – of Canoga Park, CA, died on December 15, 2006. Bill came to LAD in 1951 as a design engineer on the F-86. He subsequently moved to the NAA facility in Fresno and then to Rocketdyne where he worked on GSE for the Apollo, Space Shuttle and Peacekeeper programs. He retired from Rocketdyne in 1984 after 33 years of service.

LOFQUIST, AL P., – of Las Vegas, NV died from undisclosed causes in 2006. Reported by his wife Rita.

LOSEE, DUDLEY O., 79 – of Redondo Beach, CA died from a fall on September 27, 2006. Dudley retired from LAD in 1989 after 20 years of service.

MAUGHAN, RAY, – of Torrance, CA died on March 29, 2005. Subscription reminder card returned captioned "DECEASED". Ray retired from Tooling in 1979 after 39 years of service.

McKEE, JAMES E., 76 – passed away peacefully at home in Escondido, CA on December 5, 2006. During his 43 year career, Jim worked on many major programs including Mercury, Apollo and Space Shuttle, as well as the X-15, B-70, B-1 and the F-86. His beloved wife of 30 years, Judy, survives him.

McKENNA, JAMES J., 80 – of Titusville, FL, passed away on February 6, 2007 at his home. He retired in 1984 as an electrical engineer after working on the Hound Dog at Eglin AFB, on Apollo launches at KSC and at Palmdale on the Shuttle.

PECKHAM, RICHARD O., – of Homeland, CA passed away due to advanced lung illness on September 19, 2006. Dick retired from Space Division in 1986 after 27 years of service. He is survived by his wife Mary.

ROHR, LOUIS A., 83 – died of complications from diabetes and a collapsed lung on January 5, 2007 in Carson City, NV. He worked as a carpenter at the Corporate Office for 30 years.

STAGNARO, FRANK J., 81 – passed away from brain cancer in Long Beach, CA on November 13, 2006. Frank joined NAA in 1957 as a buyer in procurement. He rose to the position of Procurement Manager on the Space Shuttle program before he retired in 1985. He is survived by his wife of 42 years, Marilyn.

SULLIVAN, WALTER B., 97 – passed away on January 31, 2007 from undosclosed causes. Walt worked at Rocketdyne, testing rocket engines.

YOUNG, FRED E. – bulletin returned stamped "DECEASED". Fred retired in 1986 after 26 years of service from Space Division where he worked in the machine shop. After retiring, Fred resided in Poland, OH.

PAX DOMINI SIT SEMPER VOBISCUM

North American Aviation 27th and Final Annual Grants Pass Picnic

The 27th and Final Annual Reunion was held at Indian Mary Park in Grants Pass on September 6, 2006. There were 39 attendees. With a rapidly diminishing yearly attendance, the group opted to make this picnic the last one.

The picnic guests included:

Front Row: Neel Weedle, Gerry Borger, Jack Borger, and Bob Morse.

Second Row: Guest, William Hulben, Harold Hayes, Roy Mowles, Bill Francis, and Gil Judson.

Third Row: Gerald McGee, Loretta Shriner, Don Harn, Ann Trimm, and Milo Price.

Fourth Row: Gene Miles, Evan Shriner, Earl Knowles, Bob Hansen, and Joe Trimm.



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Photo from the Derek Horne Collection

In August 1951, at the National Air Races held in Detroit, Michigan, Test Pilot Frederick Ascani flew F-86E-10 Sabre, Aircraft No. AF51-2721, over a 100 km closed course and set a new official world record of 635.68 mph. That speed was averaged over a 100 km distance at a height of no more than 50 feet above the ground. This achievement earned Colonel Ascani the prestigious Thompson and Mackay trophies and the Vaulx Medal of the Federation Aeronautique Internationale (FAI).

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION Retirees Bulletin

Summer 2007

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by James Gibson

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by Cleve Kimmel

BALD EAGLES 45TH REUNION PHOTOS
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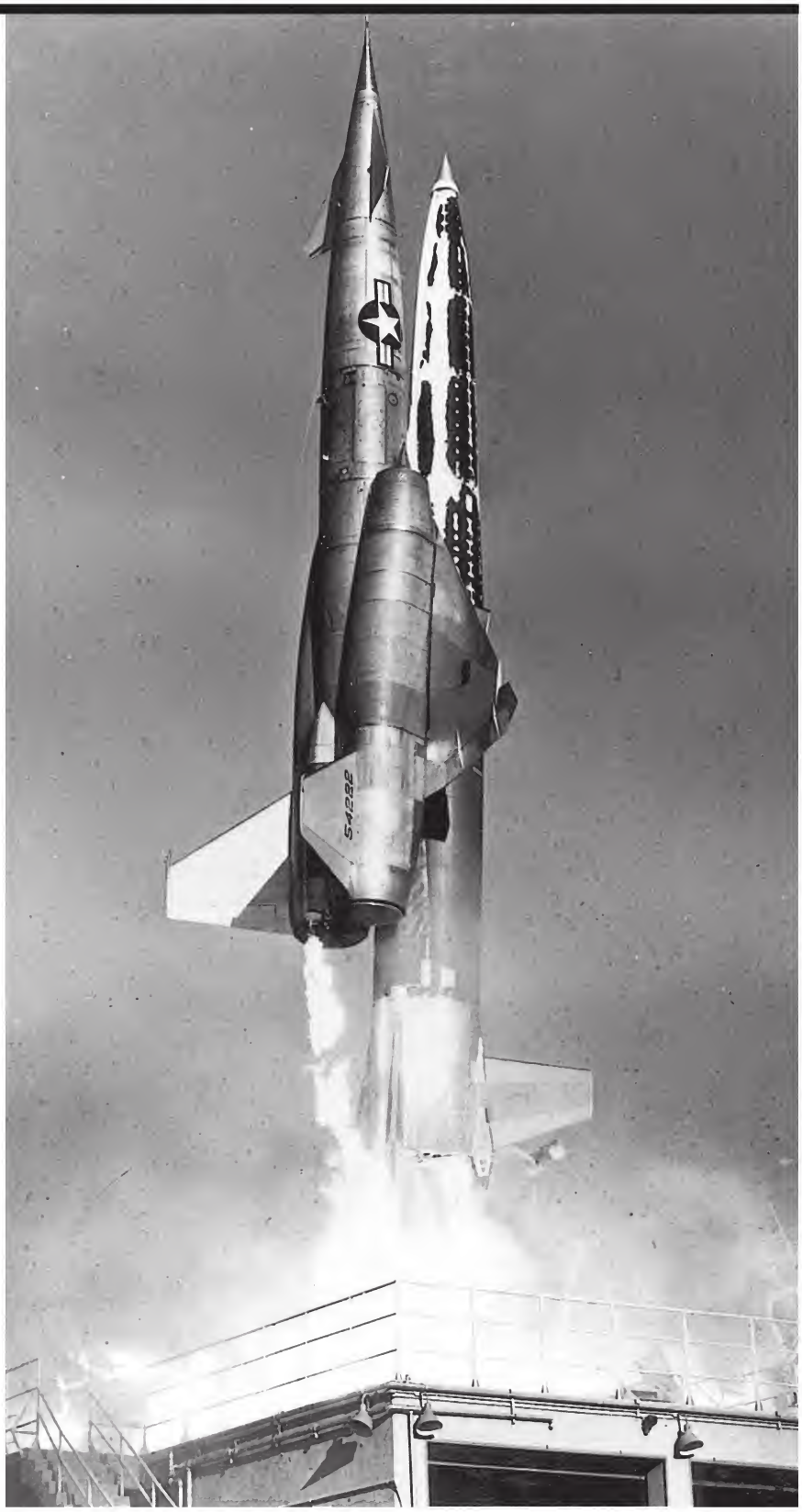


Photo from the James Gibson Collection

Fifty years ago, on July 13, 1957, the Air Force cancelled the Navaho program. Although cancelled, the Air Force agreed to five more G-26 launches to gather data on the high environment encountered at Mach 2.75. These flights were known as the Fly-Five Series. After completion of these flights, the Air Force authorized the RISE (Research Into Supersonic Environment) program to expend the remaining G-26 missiles. The second flight of the RISE program occurred on November 18, 1958. Missile G-26 No. 4 (s/n 55-4222) and Booster No. 4 were successfully launched but the vehicle broke up at 77,000 feet. This was the last G-26 launched and the RISE program was cancelled.

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Retirees Bulletin

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DEAR NAA RETIREE BULLETIN SUBSCRIBER

This being the 50th Anniversary of the cancellation of the Navaho Program, we thought it only fitting to have an article about the project and who better to write it than James Gibson. Long after everyone had walked away and shrugged off the advancements that it had wrought, James has pursued and cataloged the far-reaching work done on the Navaho Program with zeal and passion.

In our last issue, we published a letter from Cleve Kimmel. We later contacted him and he has favored us with a very excellent and detailed report on the X-15. It was too long for one issue and too good to compact into an abbreviated article so we elected to present it in three parts in this and the next two issues.

If this issue feels heavier, it is because we have gone to twenty pages. We have had such a wonderful splurge of authors that we had to expand to present as much of their works as quickly as possible. We are encouraged because we are still picking up new and previous subscribers.

On April 12th, we attended the ground breaking for the Columbia Memorial Space Science Learning Center to be built on one of the parking lots at the old NAA Downey facility. The speakers, mostly local politicians, spent two hours complimenting each other. The only mention of the accomplishments that were achieved at this site was a reference to the unfortunate loss of Space Shuttle Columbia on mission STS-107. Only a few of us attended this political sham. If you missed it, just as well because it would only raise your blood pressure!

The annual Bald Eagles Reunion this year was a welcome success with 350 in attendance, including Astronaut Wally Schirra. The speaker was James Bell, Executive Vice President and Chief Financial Officer of the Boeing Company. Mr. Bell is originally from South Los Angeles. He had overcome all of the disadvantages of those beginnings through hard work and study. Much of this was accomplished under the stern guidance and discipline imposed by his mother, Mamie Bell, who proudly accompanied him to this luncheon. Thank God for our mothers!

The 4th and Final B-1B Reunion

Will Be Held on Saturday, September 22, 2007
at the Golden Sails Hotel
6285 East Pacific Coast Highway
Long Beach, California

Social Hour 11:00 a.m. to 12:00 Noon
Lunch & Program 12:00 Noon to 3:00 p.m.

Send your check for $16.00 payable to Lee French and your meal choice of Broiled Chicken or Vegetable to:

Lee French
15452 Gary Way
Grass Valley, CA 95949

Cutoff date for tickets is September 15th.
No tickets will be sold at the door.
Contacts are:
Lee French (530) 273-3069 — Lynn Isomoto (562) 496-5604

A P-51 Mustang Memory

Old aviators and old airplanes never seem to die. They just fly off into eternity.

This is a story about a vivid memory of a P-51 and its American pilot by a boy who was 12 years old in Canada in 1967. It was sent to us by a friend.

It was noon on a Sunday as I recall, the day that a P-51 Mustang was to take to the air. They said it had flown in during the night from some US airport and the pilot had been tired. I marveled at the size of the plane dwarfing the Pipers and Canucks tied down by her. It was much larger than in the movies. She glistened in the sun like a bulwark of security from days gone by.

The pilot arrived by cab, paid the driver, and then stepped into the flight lounge. He was an older man; his wavy hair was gray and tossed. It looked like it might have been combed, say, around the turn of the century.

His flight jacket was checked, creased and worn-it smelled old and genuine. Old Glory was prominently sewn to its shoulders. He projected a quiet air of proficiency and pride devoid of arrogance. He filed a quick flight plan to Montreal (Air Show-Expo 67) then walked across the tarmac. After taking several minutes to perform his walk-around check, the pilot returned to the flight lounge to ask if anyone would be available to stand by with fire extinguishers while he "Flashed the old bird up. Just to be safe."

Though only 12 at the time, I was allowed to stand by with an extinguisher, after brief instruction on its use - "If you see a fire, point, then pull this lever!" I later became a firefighter, but that's another story.

The air around the exhaust manifolds shimmered like a mirror from fuel fumes as the huge prop started to rotate. One manifold, then another, and yet another barked-I stepped back with the others. In moments, the Packard-built Merlin engine came to life with a thunderous roar, blue flames knifed from her manifolds. I looked at the others' faces, there was no concern. I lowered the bell of my extinguisher. One of the men signaled to walk back to the lounge and we did.

Several minutes later we could hear the pilot doing his preflight run-up. He'd taxied to the end of Runway 19, out of sight. All went quiet for several seconds; we raced from the lounge to the second story deck to see if we could catch a glimpse of the P-51 as she started down the runway. We could not.

There we stood, eyes fixed to a spot half way down 19. Then a roar ripped across the field, much louder than before, like a furious hell was set loose-something mighty was coming this way. "Listen to that thing!" said the controller. In seconds, the Mustang burst into our line of sight!

Its tail was already up and it was moving faster than anything I'd ever seen by that point on 19. Two-thirds the way down 19, the Mustang was airborne with her gear going up. The prop tips were supersonic; we clasped our ears as the Mustang climbed hellish fast into the circuit to be eaten up by the dog-day haze.

We stood for a few moments in stunned silence trying to digest what we'd just seen. The controller rushed by me to the radio. "Kingston tower calling Mustang". He looked back to us as he waited for an acknowledgment. The radio crackled, "Go ahead Kingston."

"Roger Mustang, Kingston tower would like to advise the circuit is clear for a low level pass." I stood in shock because the controller had, more or less, just asked the pilot to return for an impromptu air show!

The controller looked at us. "What?" he asked. "I just can't let that guy go without asking, I couldn't forgive myself!" The radio crackled once again, "Kingston, do I have permission for a low level pass, east to west, across the field?"

"Roger Mustang, the circuit is clear for an east to west pass."

"Roger, Kingston, I'm coming out of 3,000 feet, stand by." We rushed back onto the second-story deck, eyes fixed toward the eastern haze.

The sound was subtle at first, a high-pitched whine, a muffled screech, then a distant scream. Moments later the P-51 burst through the haze. Her airframe straining against positive G's and gravity, wing tips spilling contrails of condensed air, prop-tips again supersonic as the burnished bird blasted across the eastern margin of the field shredding and tearing through the air.

She passed by about 400 mph and 100 yards from where we stood with the old American pilot saluting. Imagine, a salute! I felt like laughing, I felt like crying, she glistened, she screamed, the building shook, my heart pounded!

Then the old pilot pulled her up and rolled, and rolled, and rolled again out of sight into the broken clouds and indelibly into my memory.

I've never wanted to be an American more than on that day. It was a time when many nations in the world looked to America as their big brother, a steady and even-handed beacon of security who navigated difficult political water with grace and style, not unlike the pilot who'd just flown into my memory. He was proud, not arrogant, humble, not a braggart, old and honest, projecting an aura of America at its best.

That America will return one day; I know it will.

Until that time, I'll just send off this story; call it a reciprocal salute, to the old American pilot who wove a memory forever for a young Canadian that's lasted a lifetime.

Yesterday is history,
Tomorrow is a mystery,
Today is a gift.
That's why it's called: The Present.

GATHERING OF MUSTANGS AND LEGENDS

On September 27-30, 2007, a major Fly-In of over 100 P-51 Mustangs are expected to attend along with 51 Legends who will form an array of aces, crew chiefs, WASPs and others who were part of the P-51 Family. They will all come together at the historic Rickenbacker International Airport in Columbus, OH.

Marking the Mustang's 65th year in combat history, the majority of the 15,868 Mustangs built and still flying will be present at the gathering.

The Navaho Project – A Look Back

by James Gibson

WHAT WAS IT?

Fifty years ago, on July 13, 1957, one of the most important American missile programs came to an end. It had begun immediately after the fall of the Third Reich. It ended at the beginning of the Cold War with the Soviet Union. Its accomplishment was the development of the technology that won the Cold War and landed men on the moon.

Navaho is the oddball when it comes to the history of guided missiles. Most programs either are successful, or are cancelled and fade into obscurity. Such missiles as the ASALM (Advanced Strategic Air-Launched Missile), the Typhoon, and the Skybolt failed to be deployed and produced little technological advancement. Even several deployed missiles had short life spans because of technical difficulties and left little of a technical legacy.

Navaho, however, was both a failure and a major triumph. The technology it developed actually made possible the vehicle that made the Navaho obsolete before Navaho could be deployed. In the process, Navaho built the company that would then lead this nation to the moon and development of some of the most historically important missile and space systems ever conceived.

And yet, when the Navaho began, its concept was nothing more than a "Winged V-2" that glided into its target at supersonic speed. From this highly un-inspiring start would come a vehicle twice as long as the V-2, eight times the mass, powered by two liquid fuel engines producing three times the engine thrust and a range of over 2,240 miles. And that was just the scaled down prototype G-26.

In the past fifty years, much has been written about the accomplishments of the Navaho program. Articles about the creation of the Rocketdyne Division in Canoga Park and how the engines developed there powered the Atlas ICBM, which made the Navaho obsolete in 1957. In the years that followed, Rocketdyne engines made possible the Apollo Saturn V, the Delta Rocket and even the Space Shuttle.



Photo from the James Gibson Collection

G-26 Vehicle No. 14 being completed at the Downey facility. The jack placed under the guidance section kept the vehicle level during assembly. Otherwise, the short nose gear would make the nose droop. The tails of the missile were so high, the main landing gear had to be retracted and the missile pulled out on a low dolly. The four foot diameter ram jets are the largest to have ever flown to this day.

Other articles discussed the Autonetics Division, another offshoot of the Navaho program. These articles noted how the electro-mechanical and guidance technology developed for Navaho found its way into other "manned" air and spacecraft and into Navy nuclear ballistic missile submarines.

And still more articles reviewed the supersonic aerodynamic research accomplished by the program. One researcher recently even contacted the author regarding references to X-10 flight test data being used in the aerodynamic design of the Mach 3 XB-70 bomber.

But only a few articles and one book have ever been written about the program itself. This is due to the secrecy that the program worked under for over a decade. Articles by Dale Meyers and the author described aspects the program, but few knew the entirety of the program.

Hence, we get to the point of this article, written fifty years after the program was cancelled. What was the ultimate operational vehicle, the G-38 or XSM-64A going to be like? Fifty years after it was cancelled, the final vehicle is still the greatest enigma of the Navaho program. The vehicle all this technological advancement was leading up to has never been fully described. Even those who worked on the program in 1957 can barely describe what truly was to be the Navaho. That is until now...

THE BLACKEST OF PROGRAMS

When people talk of black programs they truly mean the Navaho. The author has met NAA engineers who today know they were working on the program but, because they were not cleared, never saw an X-10 or a G-26 until after the program was cancelled. Even the name "Navaho" was top secret as was the missile designations by both the company and the U.S. Air Force. And the biggest secret of them all was the final vehicle, the G-38. At the time the program was cancelled, its shape and dimensions was known only by a select few. And when the program was cancelled, the design was filed away.

In the decades that followed, people have pieced together some of the facts regarding this vehicle. That it used a Kerosene and LOX fuel mixture; that the booster would have three liquid fuel engines instead of two, and that the air vehicle would have a single tail. But these facts alone can't describe the vehicle properly. It's like the old story of six blind wise men who were asked to describe an elephant!

It is the secrecy regarding this vehicle that has undermined the full legacy of the Navaho program. Whenever historians look at the accomplishments of the program they tend to look at the technology of the G-26 instead of the final vehicle. The G-38 is so much more than an upscaled G-26; the two hardly are in the same category.

The G-26 used 18-8 and 17-7 Stainless Steel for both its skin and structure. The G-38 would also have these materials, but its wings were to be made using the newly developed 6Al4V Titanium. The titanium forging technology and the heli-arc

welding technique for assembly that was developed for the Navaho would later be used in the assembly of the legendary A-11/A-12/SR-71 blackbird family of high-speed aircraft.

The G-26 used Alcohol/LOX fuel for the booster, same as the earlier German V-2. The G-38 would use Kerosene/LOX, a Rocketdyne research developed high-energy fuel combination which greatly increased the thrust levels. It was this Kerosene/LOX combination that would make possible the Atlas, Thor, Delta and Saturn launch vehicles.

The G-26 used jet vanes to direct the direction of booster engine thrust just as on the V-2. The G-38 would use gimbaled engines, a very new development in liquid fuel engine technology. Gimballing was another technology that Atlas would benefit from, as well as the Saturn V, and finally the Space Shuttle Main Engines. Many people have noted the similarity of the Shuttle main engine systems to the earlier G-38 cluster.

To grasp the immensity of the project, here are the specifics of the operational vehicle that North American Aviation was attempting to design and build in 1957.

SPECIFICATIONS {G-38}

Dimensions

Missile
- Length: 87 ft.-7 in.
- Height: 15 ft.-3.5 in.
- Wing Span: 42 ft.-9 in.
- Weight: 119,424 lb. (launch)

Booster
- Length: 92 ft.
- Diameter: 6 ft.-6 in.
- Weight: 179,000 lb. (launch)

Combined
- Length: 95 ft.-2 in.
- Height: 26 ft.-7 in.
- Weight: 298,500 lb.

Performance

Missile
- Speed: Mach 3.25
- Altitude: 58,000 to 82,000 ft.
- Range: 5.220 nmi. (6,011 mi.)
- CEP: 6,000 ft. at 6,000 mi.

Booster
- Altitude of engine burnout: 58,800 ft.
- Altitude of ramjet start: 62,700 ft.
- Altitude of vehicle separation: 70,000 ft.

Propellant Capacity (gallons)
- Missile: 11,510 Kerosene
- Booster: 7,426 Kerosene
  12,182 Oxygen

Propulsion

Missile: Two XRJ47-W-7 Wright Aeronautical Ramjets
- Thrust: 40,140 lb. at 45,000 ft.
  5,940 lb. at 85,000 ft.
- Specific Impulse: 1,564 sec

Booster: Three XLR83-NA-1 liquid fuel rocket engines
- Maximum Thrust: 405,000 lb.

Guidance

Missile: Autonavigator – N6B
Flight Control – P3A

Booster: Controlled by missile guidance unit



Photo from the James Gibson Collection

G-26 Vehicle No.5 (8272) in close-up on the pad at Complex Nine. The metal hook on the rudder measured control surface deflection. Note that the covers are not on the instrument compartment. The structural rings give the appearance of being vents.

As indicated, the G-38 was a massive guided missile. Compared to the G-26 the G-38 was almost 30% longer, 6 feet greater in height from tip of tail to tip of booster fins, 14 feet greater in wingspan and a whopping 83% heavier. The all up vehicle was 11 feet longer and again weighed more than twice as much. And yet the G-38 was to be a semi-mobile weapon system.

The Navaho G-38 would be assembled at a main depot located at a U.S. Air Force base from which it would be launched. When called into action, the missile would be moved on its erector to an isolated launch site on base. Essentially, it would be deployed at one of many launch sites, erected, fueled and then fired. The Air Force projected that it would take 8 hours to do this, 16 if the vehicle had to assembled.

Yet, can you imagine trying to move this monster by road. Even with the tail and wings off, the vehicle would be quite a load. The booster alone was 92 feet long. As for the missile, it was 140 inches across without the wings: which is just under the width of an Abrams tank.

Eventually, fixed hardened launcher proposals were made. Called Navahogans after the Navaho word for home, these launchers were similar in design to the later Atlas coffin launchers used by the Air Force. From these launchers the Navaho could have been fired within 20 minutes of a launch order.

THE WARHEAD

Of course, the movement issue was not the real problem with the Navaho vehicle. The issue that would kill the program was the variety of warheads it could carry.

Navaho was capable of carrying multiple classes of nuclear warheads according to old documents. Even though the Na-

vaho was huge, the warhead selected had a major effect on the vehicle's range. The Class B warhead weighed 15,000 lbs and cut the range of the Navaho to 5,078 miles. The newer Class C warhead at 7,000 lbs was necessary to give the Navaho its full range of 6,000 miles. These old documents don't even state what the range would have been with a class D, but an estimate of 6,350 miles can be assumed.

Though capable of carrying extremely heavy warheads, this fact was a detriment to the Navaho G-38, not a virtue. Being able to carry a class "B" bomb like the 5 megaton Mk-21 thermonuclear warhead had very limited value in 1956. By that time, both Class C and Class D warheads had been deployed with equal yields but greatly reduced weight. Of particular note were the Class D's which weighed in at less than 1,500 lbs. The Atlas warhead was just such a lightweight Class D warhead.

Navaho had the edge in that it could carry over ten times the payload of the Atlas; but it didn't need to. Someone, late in the program, proposed that the Navaho be turned into a drone bomber, dropping multiple warheads during its one flight. But the idea was impossible, given that the vehicle stayed structurally stable due to internal pressurization. To try and open a bomb bay at Mach 3.25 would literally tear the vehicle apart during the initial delivery.

If the weight of the Hydrogen Bomb had stayed over 7,000 lbs, Navaho would have won out over the Atlas. But minaturization was a major activity in the 1950s. Even Navaho was caught up in this effort with solid state circuitry in its guidance and flight control systems. The development of solid state electronic systems was one of the reasons the Hydrogen Bomb shrunk in size.

THE TECHNOLOGY THAT MADE IT POSSIBLE

Even though the vehicle was killed by warhead developments you have to take note of everything that came from the Navaho program. To make even the G-26 work, required a number of technological breakthroughs that were essential in the making of the subsequent Apollo moon vehicle.

The author feels the comment made in the official Air Force history of the program stated it best. The by-products of the Navaho program deserve more consideration than could be granted in this abbreviated treatment of the missile development process. Apart from the serendipitous benefits of the technical program, the Navaho effort directly and immediately contributed to several major programs that (at the time this is written) bulked large in the nation's defense. Both the B-70 and the abortive F-108 programs drew heavily on Navaho airframe developments. The SM-65 Atlas—and for that matter, probably most of the United States rocket vehicle effort—relied on engines originally developed for the Navaho. The guidance system found widespread application in both air vehicles and elsewhere- including nuclear-powered submarines for example. Launch techniques, instrumentation processes, test range procedures, manufacturing devices, management innovations: all these, and many other facets of the Navaho program influenced the course of other major programs undertaken by the three armed services of the United States. For obvious reasons, it proved impractical in most instances even to hint at later applications of Navaho technology.

Fifty years later the author can hint at several other programs the historians in 1961 couldn't predict. The Apollo Saturn V first stage used liquid Oxygen Kerosene engines built by Rocketdyne. It also used the Navaho technique to attach the insulation fiberglass to the LOX tank. The later Delta II, III, and IV expendable launchers, the Atlas until recent years, and the Space Shuttle all use Rocketdyne engines. Rocketdyne would in fact make the engines for all the important space launch vehicles including the Redstone that carried the first U.S. satellite and the first American Astronauts.

Other programs benefited from the Navaho guidance technology. Hound Dog used a reduced capacity Navaho guidance with star-tracker inputs. The Polaris and Poseidon ballistic missile submarines, in turn, used an enlarged unit called the N-7 to accurately track their locations. The A-5 Vigilante also used Navaho guidance and flight control technology to make it an accurate bombing and reconnaissance aircraft. Even the Northrop Snark used an early Navaho N-2C as a back-up guidance unit.

As the Air Force history put it, "North American proved that inertial guidance could be based on a 'local-level vertical gyro concept' in which the gyros and accelerometers were always oriented to the local gravity vector. The concept established by MIT, and generally accepted at the time North American began work on the N-6, was to keep the gyros fixed in relation to vertical space. Without doubt, the Navaho guidance program had produced results of considerable benefit to the Air Force and the nation. As for the N-6A, the end product of the work in the SM-64 program itself, it was apparent that the prototype systems available for test in 1957 were significantly better then any comparable systems produced by parallel or competing programs."

Other Navaho developments were chemical milling, solid-state electronics, the airborne digital computer, heli-arc fusion welding, plymetal (stainless steel honeycomb material), and aluminum honeycomb.

And yes, Cape Canaveral owes Navaho for the development of most of the liquid oxygen safety procedures, the first radar tracking system at the base, radar controlled cameras for documenting flights and basically the general testing processes used today.

OF COURSE THE MYTHS WILL CONTINUE

And what do I mean about the myths. Well for one, the myth of launching an F-108 or an X-15 from the back of a Navaho booster. Most recent models of these proposals used the G-26 booster in their depictions. The real booster proposed for these methods was the G-38.

Think about it. The X-15 concept was supposedly intended to put the X-15 into orbit. To put a 3,000 lb Mercury capsule

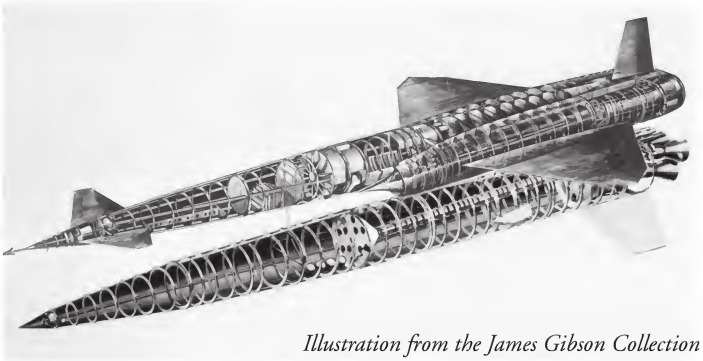


Illustration from the James Gibson Collection

into orbit required a 260,000 lb Atlas ICBM with a take-off thrust of 360,000 lbs. The X-15 weighed ten times that of a Mercury Capsule or 33,000 lbs. Add to that a disposable ablative heat shield like that tested on the X-15A-2 and you get a payload of at least 37,000 lbs on top of the 76,000 lbs of the G-26. Total takeoff weight would therefore be over 113,000 lbs. The G-26 booster's 240,000 lb thrust just barely gives the same amount of over thrust as the Atlas Mercury combination.

A G-38/X-15 combination, however, is more plausible. The combined weight of 200,000 lbs would give a two to one thrust to weight ratio. This is why the originally drawings of the concept show a three engine booster instead of a two engine.

As for the F-108 Rapier, well the numbers are quite specific. The F-108 weighed 200,000 lbs fully loaded. Add to that the all up weight of a G-26 booster of 76,000 lbs and you have a total mass at takeoff of approximately 276,000 lbs. The maximum thrust of the G-26 booster was only 240,000 lbs so to make it work at all would require the G-38 booster.

Of course, even with the mighty G-38 booster the whole concept wouldn't have worked. To make it work would have required the installation of the G-38 autonavigation and flight control system into the X-15 or the F-108. Then electronic connections would have had to be made between the booster and its payload. Otherwise, the G-38 booster had no guidance inputs.

The idea of using the G-38 booster for these projects was just as bad as the proposal to turn the G-38 into a satellite booster. The G-38 structure was not designed to carry a payload on the nose; this is why all the F-108 and X-15 drawings show them in piggyback mode. Add to this the fact that the engine thrust was only for 100 seconds while an Atlas operates for at least five minutes. Finally, some form of guidance system would have to be devised to control this launch vehicle.

Probably the greatest myth perpetuated by the secrecy of the Navaho program is the Russian Navaho or Burya.

CAN WE STILL LEARN FROM THE NAVAHO?

The answer to this last point is, "Yes". Even more so today than forty years ago when Apollo engineers were reviewing existing Navaho technology as they were preparing to send men to the moon. Technology developed in one program may be applicable to new programs or applications. But already built examples will not be as effective as newly designed items based on that same technology.

Today we are trying to turn the components of the Space Shuttle into two new space systems. Called the Orion project, there is the manned Ares 1 vehicle and the unmanned Ares 5 heavy lifter. These two vehicles are to be the means by which we will again land humans on the moon.

Unfortunately, the concepts may fall victim to the same problems that insured the G-38 booster could not be used for other projects. The load paths on the Ares 5, which is built from the Space Shuttle fuel tank, were designed for piggyback carry. Either extensive work will have to be done to strengthen the upper portion of the tank to carry the payload without collapsing, or extensive analysis done to prove that the present design will work.

There is also the addition of engines at the base of the tank to propel the vehicle into space. Again, the base of the tank was never designed for thrust loads in that area. Like a beer can being pressed on both ends, the whole tank could crush if the compressive loads are too high.

Then, there is the issue of guidance. Or more specifically the guidance commands for the solid motor gimbals. Like the G-38 in which the guidance unit coordinated the gimballing of the three motors with the aerodynamic surfaces of the G-38, in the present Shuttle design the Shuttle guidance computers coordinate the solid motor gimbals with the gimballed engines of the Space Shuttle to achieve flight control. The new Ares V will need a guidance computer added somewhere on or in the tank area that will coordinate the new motors and the solid rocket gimbals.

Of course, there will be no coordination in the Ares 1 since it only has one solid rocket motor. The guidance inputs also came from the Shuttle through the tank to the solid rocket motor. Some additions like an electronics tunnel will need to be added to carry the guidance inputs from the new Crew Exploration Vehicle (CEV) on top of the stack down to the engine gimballng units.

Furthermore, the long solid rocket motor casing was also never designed to carry compressive loads. It was designed to restrain the internal explosive force of the burning solid rocket fuel. And this internal explosion will be greater in the new Ares vehicles since an additional two segments of solid propellant will be added. The first flight of this vehicle will be most interesting.

We need to realize that the real worth of a vehicle or a program is not the final vehicle but the technology developed to create it. To build Navaho, North American Aviation gave American Aerospace: chem-milling of aluminum, titanium forging, heliarc welding, advanced aerodynamic data, solid state circuitry, long term inertial guidance, and numerous other technologies that are today baseline in the industry. The Shuttle program provides a wealth of technology and research into the design of a reusable space vehicle, particularly in how to build for maintainability. Much of this work, however, will not be used in the CEV because they intend to use as much of the present design as possible.

About the Author: James Gibson is currently assigned to the Materials and Process Engineering group at the Boeing Huntington Beach Division. He is a published author of two very comprehensive books: The Navaho Missile Project and Nuclear Weapons of The United States. As an engineer, he has worked on the International Space Station, Delta launch vehicles, and the Space Shuttle. James is the son of William Frederick (Hoot) Gibson Jr. who spent thirty-five years as a stress engineer at the Downey facility. The senior Gibson is a veteran of the Navaho, Apollo and Space Shuttle programs.

HERE IS A TEST TO FIND WHETHER YOUR MISSION ON EARTH IS FINISHED:

IF YOU'RE ALIVE, IT ISN'T.

The X-15 and Its People - Part I

by Cleve Kimmel

Author's Note: The X-15 Program developed over 200 technological breakthroughs; and was a major factor that led to the successes of the Apollo Program, anti-missile missile development, long range optical and camera development, guidance control development, and the Space Shuttle Program. This report tells about the little known "behind-the-scenes" events that took place during my tenure as a design engineer and, subsequently, as a program manager during this aircraft's development.

Between June 1952 and July 1954, the National Advisory Committee on Aerodynamics (NACA) reviewed the needs for improved technical knowledge of outer space and what was actually required. It was the Langley Aeronautical Laboratory, the Ames Aeronautical Laboratory and the High Speed Flight Station that began the flight studies that led to the actual need for the X-15. Cost and time were a restraint, and even the land-based wind tunnels at Langley could not achieve the needed goals. This requirement for better understanding of aerodynamics of space flight was placed into a lengthy proposal for a new research vehicle, and was presented to the Air Force and Navy project offices in July 1954. The Air Force was to be the prime manager, NACA was to manage the flight-testing, and the Navy was to assist in minor roles. The technical bid went out to several aircraft companies in December 1954; and in September 1955 North American Aviation, Inc. (NAA), Los Angeles Division, located in El Segundo, CA, was selected to be the manufacturer. Charlie Feltz was selected as the Program Manager and Bud Benner was his assistant. NAA constructed a huge sign that read: *"Home of the X-15"*. It was mounted on top of the main engineering/production facility.

Three aircraft were eventually to be constructed; with the intent that one would always be available to fly, while the other two were being readied for flight. There was also the strong possibility that one aircraft could be destroyed in flight-testing. NAA was selected over the three others by agreement of the reviewing committee as "the one most suitable for research and potentially the simplest to make safe for the mission". In December 1955 the contract was actually awarded. I arrived on the scene in May 1956, three months after my discharge from the Army. I was assigned to the Powerplant & Propulsion Systems Group design analysis section, headed up by William Hand. My initial task as a chemist was to become thoroughly familiar with the propellants and gasses to be used in the X-15. Seventy people were in that small design section.

The X-15 was a truly awesome aircraft. It was designed to achieve hypersonic speeds; speeds in excess of Mach 5; and to climb to over 50 miles above the earth's surface. It was actually the first aircraft to be piloted into space. On March 7, 1961, U.S. Air Force Major Bob White-using only 50% of engine thrust-leveled off at 75,000 feet and reached Mach 4.43, becoming the first pilot to exceed Mach 4. Three months later, on June 23, Major White again using partial thrust reached Mach 5.27. Again, on November 9, he set the controls to full thrust and climbed to 100,000 feet, leveled off, and accelerated to Mach 6.04. It had taken the Space Program nine years to go from Mach 1 to Mach 3, but the X-15 went from that to Mach 6 in just nine short months! The X-15 exceeded Mach 5 on 109 occasions, and Mach 6 four times. It soared above 200,000 feet on 42 flights, and over 300,000 feet on four of its missions. NASA's pilot, Joe Walker claimed the peak altitude flight of 354,200 feet (67 miles) while flying the X-15A-2. Air Force Major Pete Knight holds the speed record in the same plane, at Mach 6.72 (4,500 mph). The aircraft was constructed mainly of titanium and Inconel-X. The X-15's celestial navigation system concepts were ultimately incorporated into the Apollo.

Some of the major scientific achievements discovered or achieved by this aircraft were:

1) Hypersonic boundary layer is turbulent
2) Hypersonic boundary layer heating is lower than expected
3) Hypersonic skin friction drag is lower than expected
4) Hypersonic surface irregularities cause localized hot spots
5) Provided methodology and demonstration for re-entry control from high altitude that was later applied to the Space Shuttle
6) Through the unique ball nose servo control accurate measurements of air speed and flow angles were obtained at all speed ranges
7) Demonstrated that the blending of reaction control systems with aerodynamic controls were practical; and were later applied to the lifting bodies and the Space Shuttle
8) Demonstrated that the flight phenomena encountered during re-entry from space at high speeds could be predicted and the results applied to the Space Shuttle re-entry designs

To launch the X-15, it was decided that a modified B-52 would carry it aloft attached to a pylon mounted under its right wing, and the launch would take place at an altitude of 45,000 ft, and airspeed of about 500 knots. Boeing made some structural modifications to the aircraft to support the added weight, and flew the modified aircraft down to NAA for addition of the pylon. During the flight down with B-52 Ship No. 0003, (the third aircraft that was built), the pilot reported a banging noise in the aircraft, sounding like metal hitting metal! Everyone laughed at him, until later on when they opened one of the fuel tanks to add some additional supports. Inside of that fuel tank was an aluminum ladder, left there by some mechanic at Boeing.

To prevent premature drops of the airplane, such as those that had occurred with the X-1, the language usage was carefully prepared by the pilots and ground controllers. The term "DROP" was substituted for "LAUNCH". And "SECURE" was entirely removed from the language. Inadvertent DROPS did not occur in the X-15 program!

For thrust, the NACA Committee for Aircraft simultaneously selected the Reaction Motors' proposal for the 57,000 pounds thrust rocket engine. It was to be throttleable from 17,000 pounds of thrust to the fully rated 57,000 pounds. The production engine actually achieved 59,000 pounds of thrust. This contract was awarded in February 1956. To push the X-15 into high speeds; this powerplant had to exceed by far, any known engine of its type. In 1955, when the requirement for the X-15 was created, America had only eight years of large rocket engine experience; and that solely with single-shot



Photo courtesy of the AFFTC History Office

Prior to its first glide flight, X-15 No. 1, 56-6670, with the long nose sensor boom is being uploaded at Edwards AFB to the Boeing NB-52A launch pylon.

missile flights, where safety was secondary. Launch failure with this aircraft fully fueled would be disastrous. The propellant flow required a pumping system that used more power than ever obtained before, and a new turbo-pumping system had to be created. My job was to design the system that fed this monstrous pump, and to assure that it would be 100% safe throughout all uses and aircraft operations. The system had to operate in virtually all g-load combinations of flight, including zero-g and negative-g loads. A ninety-percent solution of H_2O_2 and water was selected as the fuel media that powered the pump. Converting this product by catalytic combustion to steam produced a reliable mixture that generated great thrust for the pumping systems that fed the engine with propellants. It operated successfully throughout the life of the X-15, without failure of any sort.

To support the urgent need for technical atmospheric data, NAA committed to a three and a half year delivery schedule for the X-15, with an anticipated rollout date of October 1958. During this short period, I began to understand the workings of a manufacturing giant! There was no room for errors, and accurate decisions had to be made in all areas of design and manufacturing. Considering that calculators and computers did not exist in this time period, the production of this aircraft was a remarkable achievement. Initially, I was assigned to study the physical properties of Liquid Oxygen (LOX), Anhydrous Ammonia (NH_3), Helium (He) and 90% Hydrogen Peroxide (H_2O_2), plus the material effects that these products might have upon the components that would be in contact with them. Amazingly enough, very little research had been conducted in America on these materials, although many testing laboratories had started investigations into some of their thermal and pressure ranges. Russia was the leader in technical information, and by far surpassed the data used by Germany in the development of the V-2. Although unmanned missile flights had been in progress for about five years, the absolute critical need for assurance that "nothing could go wrong", was never fully addressed.

My job was to assure the NAA team members and NASA, that there would be no mistakes made in the use of these liquids and gases. It all seemed so simple at the beginning but it wasn't until the creation of development testing started, that the full impact of the unknown certainties became apparent. Amazingly enough, the various firms that produced these liquids and gases for a living, had only minimal information or knowledge of their behavioral patterns when placed in the extreme environment being required of them in the X-15. These parameters, once defined, became the basis for the creation of technical specifications used by others in the development of special valves and components to be used in the propulsion systems, for which I was to ultimately be the responsible engineer. What a surprise! Since throughout all of my college life I deliberately stayed away from anything having to do with "engineering", thinking that this science was beneath me! Chemistry was my interest. Later in life, I was very surprised to find that there were truly great engineers out there, and some of the greatest of them became my close and personal friends.

Having studied all available technical data on cryogenics and helium gas from various sources around the world that I could locate including Russian documents, I started to compile the physical relationships of these fluids as related to the X-15 planned environment. This meant using my "trusty 12-inch K&E slide rule" as the *analytical tool* to solve equations and problems. My mentor, George Paterson, a senior engineer who had spent several years with Boeing Aircraft, taught me how to predict absolutely accurate flowrates through piping and valves using only one analytical point, and plotting that point onto graph paper. Although crude by today's standards, it was verified many times over to be 100% accurate in all conditions of flow. The only people in 1956 who had access to a computer, the IBM 7090, were the stress and flight dynamics departments. These departments later on would play a very important role in the future development of fluid components for the X-15. I designed all of the individual components with either dual or triple redundancy in mind, plus considerations of system performance, should the pilot accidentally make an error in judgment. These features saved both the X-15 program and the lives of pilots several times. Very little has been made public about this fact, since it was considered normal for a system designer of that day to think of everything needed, and to do everything correctly. Had the goal been to generate patents, I could have filed for about 200. Every part that went into the X-15 was first tested for compatibility with the fluids, its mating part, and with the operational environment before being mated and fully tested with other portions of their related counterparts and subsystems. This was where the FUN really began. Some of these memorable happenings were not so funny.

To better understand how the LOX system operated during periods of aircraft flight emergency, jettison tests (emptying the tanks) were conducted using a mock-up system at the NAA Rocketdyne Division in Canoga Park, CA by the test supervisor, Bob Field. Bob would later play a very important role in the aircraft testing at Edwards Air Force Base and then at Downey

on the Apollo Project. To keep the testing as safe as possible Liquid Nitrogen was substituted whenever possible. To assist in the dispersal of the liquid (-320°F) a heavy water spray was used at the discharge site. This worked fine, and when it came time to test the system with LOX (-297°F), the same procedure was followed. What a difference this was! The LOX stayed together like a "large puffball" and rolled about the area, moving with the wind. We all scrambled to get the electrical power turned off throughout the entire Rocketdyne facility, and not just the test site itself since the "ball" had absolutely no intention of melting into the air! When later tests were made, all of the adjoining site area personnel were ordered to evacuate the area and turn off all electrical power. Performance information on the discharge was recorded on high-speed paper printers, and one test would produce about 200 feet of paper. A glass scale was used to read the data lines, which resembled an EKG printout, and the information was converted to real values. Test technicians were assigned to perform this task, which typically took several days to extract the information, convert the calibration settings, and report the actual results. Procedural steps for handling LOX discharges were created.

The oxidizer (LOX) would have to be replenished during the time that it was airborne in the B-52 carrier aircraft. As the aircraft ascended to launch altitude, the lower atmospheric air pressure (about 3.5 psi) caused the liquid to outgas, and lower its absolute temperature by boiling away. Additionally, some liquid was lost due to thermal heating from the flight. About 1,000 gallons were normally required during the flight to replace the lost LOX, the same amount as needed for the flight. The vented LOX gases had to pass through the system's LOX vent valve, and it was here that the first major system problem surfaced. The LOX valve was initially contracted to the Whittaker Corporation for design and manufacture, and the valve wouldn't close when commanded to do so by the pilot's control system. Whittaker could not solve this design problem. I requested that the valve contract be cancelled and the valve fully redesigned and manufactured by the NAA design team in time to support the initial flight tests scheduled to start in a few months.

The valve was designed to act as an emergency "burst disk", as well as a relief valve. The relief portion worked as designed but the emergency portion could not withstand the forces and would always fail under load. I conducted some "high-speed" camera studies at 1,000 frames per second and found the problem. The butterfly blade closure unit couldn't stop quickly enough due to the initial inertia buildup and broke apart upon impact against its stop. The aerodynamic teams who normally develop the aircraft airfoils and control surfaces were asked to perform their magic and design the blade so that it operated much like an airfoil of an aircraft. This was the first time, the group had ever been asked to assist in valve development, and they thought it would be fun to try. The valve disc blade had to be flexible, and when operated, the vented gases were to straighten the assembly out before impact against its stop. All of this had to be accomplished within 5 ms of time. The new blade, when tested would flex about 1.5 inches at its tip (the valve was only 6" in diameter). The new valve blade resembled a tortilla in design, but solved the mechanical breakage problem very easily.

It was this type of teamwork that NAA had throughout its staff that made aircraft production a breeze. In later years, with the advent of many overriding employment requirements imposed by the government that lowered the technical standards and qualifications of technicians and engineers, this teamwork would be lost, with very few people caring about completing their project assignments according to a schedule or conceptual safety design standards.

When we first tested the redesigned LOX valve, the bets were all against the aerodynamic team. No one really believed that the flimsy looking design could actually work, let alone stand up to the harsh environmental forces. A new level of confidence arose in the NASA and NAA teams when the test results matched my calculations to a tee.

Even before LOX could be used as a propellant, extensive research was conducted to determine if any of the materials being proposed for use in the system would be compatible. This testing program was also a shock! After a decade of flight-testing and production of missiles with LOX, the scientists and engineers on those projects had done virtually nothing to establish absolute material compatibility-they just used them. We conducted ignition, shock and impact tests on all materials that could even remotely come in contact with LOX or its vapors, and only the safest ones were used. This limited the material base for production, but provided a safe environment for the pilot and aircraft. Seals and sealants were the hardest to find compatible with Helium, LOX or NH_3. All of the existing soft-seated production seals tested would fail! I ended up designing new flexible seal configurations and Parker-Hannifin successfully developed reusable metal-to-metal seals. Costly, but 100% leak tight.

The X-15 flight research program consisted of a series of steps, each one going to higher altitude and higher speeds. Along the way new data would be obtained that confirmed wind tunnel data or provided new information about the atmosphere. Additionally, many classified and secret experiments were carried on to develop techniques for trajectory planning, missile guidance and detection, high altitude photography and the like. Many months before the first airplane was delivered, NAA constructed a multi-axis simulator that virtually duplicated the X-15's cockpit and control systems. Between 100 and 600 hours were spent in this simulator, running approximately 400 missions, before the pilot ever flew the X-15. To assist the pilots in determining corrective actions, in cases of emergencies, many failures were built into the device. To further test the pilot's abilities, the ground test crew at Edwards Air Force Base, connected both the test simulator and the actual aircraft to the site simulator, and they would occasionally deliberately cause a malfunction to the test, forcing the pilots to react to real situations of mechanical failures. It was tough to "trick" them. These pilots knew the aircraft systems even better than the designers and test crews!

Before the actual flights began, a Lockheed F-104 aircraft was modified to closely simulate the X-15's flight and handling characteristics. The pilots used to say that this was akin to "flying a rock". Early in the program, before each mission, the pilot would fly the modified F-104 along the designated X-15 flight route, and land at the alternate and primary landing sites. He would also familiarize himself with the geographic checkpoints and key altitude and flight vector patterns necessary for mission success. The F-104 aircraft had been modified by NASA,



Photo courtesy of the AFFTC History Office

All three X-15 vehicles, 56-6670, 56-6671 and 56-6672 being serviced in a hangar at Edwards AFB in various stages of preparation for launch from a Boeing NB-52.

and fine-tuned by one of their crew chiefs. The crew chief spent many hours in the cockpit, which was modified slightly to simulate the X-15's cockpit, driving the airplane back and forth across the dry lakebed, until he had the handling characteristics just exactly right. The X-15 had only a nose wheel for landing, and skids on the rear. It also had the nose wheel locked into a fixed position. The F-104, however, did have a controllable nose wheel.

To further assist the pilots in determining how to operate the X-15 under high g-loads of thrust, the human centrifuge constructed at the U.S. Naval Air Development Center in Johnsville, PA, was used to simulate the effects of variable gravity on the pilots' reactions. The tests showed that the pilots could operate flight controls up to 15 g's. Typically, the flight path would be under a 6 g load, and the landing phase over 10 g's. All of this had to be accomplished while restrained in a pressure suit. The David C. Clark Company designed this suit, and it consisted of a link-net type of fabric that covered a rubberized pressure garment. This acted almost like a second skin, and allowed full freedom of movement. This technology was later transferred to the Mercury and Gemini Programs, and then as the standard apparel for fighter squadrons of the Air Force's Air Defense Command!

To further compound the problem of flight, there were many skeptics who insisted that manned test flights couldn't be performed, and that unmanned ones were the only way to achieve the objectives. Continuously throughout the testing program, these two factions were always at each other's throats. One of the most controversial concerns was the physiological response of the pilots.

Prior to this test program, there were virtually no actual test data on the human body's responses to conditions that would impose stress. Over the years, the bio-physicists developed means to measure heart rates, breathing rates, oxygen flow, skin temperatures and blood pressure in flight. The first flights created quite a stir among physicians; for the heart rates averaged 145 to 160 beats per minute, with some as high as 180 to 185. The highest rates occurred just before launch, which reflected awareness in anticipation, rather than real physical stress. James Clark, instrumentation systems designer, was first assigned to create the pressure gauge for the pilot's oxygen breathing system. Scott Crossfield, NAA's planned test pilot for the X-15, met



Photo courtesy of the AFFTC History Office

During Flight No. 114 on August 14, 1964, X-15 Vehicle No. 2, 56-6671, achieved a speed of Mach 5.23 and an altitude of 103,300 feet while being piloted by Robert Rushworth. The nose landing gear was extended at Mach 4.5 at 78,000 ft. Both tires blew on landing with heat damage in the wheel well.

with him and relayed just how important this gauge really was. His life depended upon its accuracy and reliability under all flight conditions! If the gauge reported adequate oxygen was remaining, when in fact, there was little or none available, he would most certainly blackout from oxygen starvation, and the uncontrolled X-15 would crash. This imparted a true sense of realism to James. Similar discussions with other engineers set the same tone, accounting for the deep pride each engineer had for his role in the overall design.

During the final design and development of the gauge, based on the development package provided to a major manufacturer of pressure gauges, everything appeared to proceed quite well. That is until James personally examined the test results of the gauge. He had specified that in addition to testing at "normal room temperatures" during vibration, the gauge also had to pass tests starting at -350°F cold-soak, and that the temperature couldn't increase more than 50 degrees during the testing. The test results provided no indication that this was accomplished, nor was any explanation provided of how the temperature was achieved and monitored by them. The manufacturer stated that *they had no intent to perform such a test, and that to do so was impossible!* This was a typical attitude of virtually all component suppliers of that time, and all tried to get by without really meeting what they agreed to do. They had previously contacted their procurement counterpart at NAA, (bypassing the engineer, James Clark) and were told to "simply cold-soak" the unit before test, then proceed. The rest didn't mean anything of importance!

The firm was reinstructed to either perform the test, or fully describe how they did it, with full descriptions of the instrumentation designs and layouts as well as the time-temperature profiles throughout the complete test cycle. They were provided with guidance into how this could be accomplished. Reluctantly they complied. The test showed that the gauge worked perfectly fine, until the results were compared with the true pressures in the system tanks. The gauge had failed, and reported higher pressures than were actually there! Having found that their original concept of a working gauge was flawed, they gladly redesigned the unit, and all subsequent units were completely accurate. The supplier became one of the best gauge manufacturers in the country.

The gauges used to record the rocket engine's performance throughout the X-15 flight regime were created after the industry current standard concepts: *"Bent-Tube, pressure transmitters and numerous cockpit display gauges"*. The challenge was to have units that were in contact with liquid oxygen be "hydrocarbon free". All units that were delivered for the X-15 were rejected for contamination. They were originally double-bagged in special plastic containers, and the manufacturer capped the ports. It was inconceivable that they could be contaminated, since the cleaning and bagging operations were carried out under Class 100 Clean Room requirements, and the processes were verified to be correct.

However, NAA Receiving Inspection teams were found to be opening the bags and testing the units for proper calibration using *hydraulic fluid!* After the test, they flushed out the oils with a hydrocarbon-based solvent, and rebagged the units. The testing was changed to nitrogen gas, and the receiving departments were educated in the processes. But this didn't help.

The manufacturer, selected by Procurement, was not qualified for processing contamination-free units, and had no knowledge of what that even meant, including a clean room environment. He underwent an education process, and agreed to correct his operation accordingly. After that, these units were okay. However, months of work went into the training.

The X-15 had small wings in contrast to its massive tail surfaces. These surfaces acted much like the feathers on an arrow, which ideally keep it on its flight path. However, the X-15 had to change course, turn, and maneuver. This created a need for a very reliable control system. Hydraulics, coupled with control cables were designed and installed. The design loads had to be extrapolated, since there was no empirical data available! The X-1 and X-2 had experienced such large decreases in stability at high Mach numbers (above Mach 2) that the pilots lost control. The X-2 crashed as a result of trying to control the aircraft's flight path by only a 5- or 6-degree variation from the release trajectory! Reentry of the X-15 would require maneuvering it at angle of attacks approaching 25 degrees variation.

To assure that the control cables were always in good condition, they would be occasionally replaced. On Ship No. 1, the NASA crew chief, not trusting the accuracy of the NAA engineering drawings, measured the cable he had removed, and called in the dimensions to NAA. NAA fabricated the cable, and when placed into the airplane found to be too short! Tempers flared, and NAA had to re-fabricate the cable with the same results. This time NASA top management called NAA's President Dutch Kindelberger and Chief Engineer Harrison "Stormy" Storms, reading them the riot act for total incompetence. The Chief Engineer witnessed the next fabrication and personally carried it up to NASA. Awaiting him was a very upset NASA team! Before installation, he insisted that the NASA crew chief compare the new cable to the one removed from the airplane and, lo and behold, the new one was also too short. Stormy asked the crew chief how he measured the old cable. He proudly took a tape measure from his toolbox and showed how he made the measurement.

Sure enough, his dimensions were the same as the ones given to NAA! Stormy said, "Let me see that tape." NASA had been using a surveyor's tape, which recorded tenths of feet, not inches! Were the NASA officials and the crew chief embarrassed! After a good laugh, NAA re-fabricated the cable using the "real" measurements indicated on the drawings, and it fit perfectly! The rules about using non-standard tools were re-enforced by NASA.

To assist the pilot at high altitudes, a series of reaction jets, using the world's oldest form of harnessed energy—steam—was employed. To operate these jets, which were actually small rocket motors, Bell Laboratories was selected as the designer and manufacturer. The jets used 90% H_2O_2 as the rocket fluid media (fuel). A pressurized source pushed the fluid to the inlet of the jet (rocket motor), and when a shut-off valve opened through pilot control, the H_2O_2 passed through a solid silver igniter causing a catalytic conversion into steam. This steam produced the thrust needed to push the aircraft's nose in another direction. Unfortunately, not too much was known of the harsh environment these devices had to work in.

Although Bell Laboratories was the leader in this type of technology, having built the X-1, they couldn't make the nozzles operate as designed. The nozzles would freeze up, fail to start, and occasionally sputter and not shut down. NAA took over the design, and developed a two-stage silver screen catalyst bed (a cylinder about 1" in diameter and 3" long), that worked 100% of the time with no "dribble" volume waste at shutdown. I assisted in the pressurization and feed system's redesign. These jets were placed in the nose for pitch and yaw control, and in the wings for roll control. While such a system is simple in principle, when it was developed in 1956, it was a novel and bold concept. The transition from aerodynamic control to thruster jet control was one of the most difficult to overcome for the vast unexplored regime of space. After the concept had been proven on the X-15, it was adopted for the Mercury Program, where it was used successfully. All satellite systems flying today use some type of "attitude thruster control", and the design use is well understood, thanks mainly to the pioneers on the X-15 program, and the pilots who tested them. Without these jet forces, the airplane could not have remained "weather-cocked" and stay on its projected flight. It would have been tossed about without control as to direction or heading.



NASA Photo

X-15 No. 3 completes a test flight with a Lockheed F-104A chase plane at Edwards AFB.

A flight test corridor, stretching from Wendover AFB in Utah was created with emergency bases established along the way. The dry lake at Edwards AFB is 12 miles long, allowing plenty of room for error corrections to flights at time of landing. After designing the X-15's fuel and pressurization systems, I remained on as a consultant, but never went to Edwards to watch the tests or the flights during the period before June 1960. It was at that time, on June 8, 1960, that Ship No. 3, having been equipped with the new XLR-99 engine with its 57,000 pounds of thrust, blew up! This was the first run-up test of the larger engine, and the aircraft was restrained in its thrust stand. Scott Crossfield was at the controls, and during the engine test, the ammonia tank apparently blew apart due to a suspected tank pressurization system failure. It was this failure of the system I created that propelled me back into the X-15 program on a full-time basis, and this was where the leadership for the Apollo Space Program by Charlie Feltz, got its start!

Editor's Note: This detailed X-15 saga will be continued in the Fall 2007 Issue of the bulletin.

BOOK REVIEW

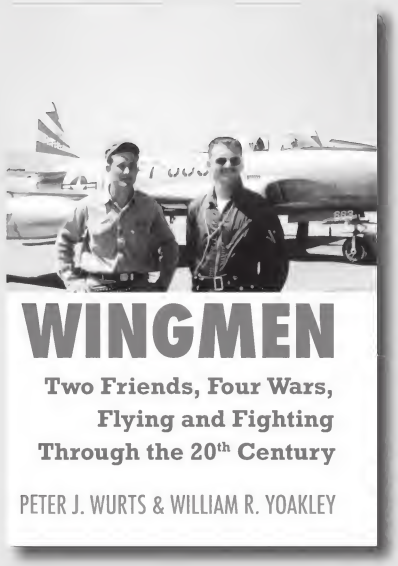
WINGMEN

by Peter J. Wurts & William R. Yoakley

Wingmen are military pilots who look after each other in combat. These wingmen, Pete Wurts and Bill Yoakley, are something more. A friendship that began when they were assigned adjacent bunks during flight training at Gardener Field in Taft, California, would span sixty years through four wars—World War II, Korea, Vietnam, and the Cold War, where they served as citizen soldiers.

Readers will remember Bill Yoakley from his articles in this publication—clipping a mountaintop in Korea and bailing out from an ailing F-86 in the waters around Catalina as an NAA test pilot. You can order this book from Amazon or get it direct from Bill and ask him to dedicate it to a family member or a friend. It's a great gift and a fantastic adventure story. Send your check for $25.00 to:

William R. Yoakley
911 Fleming St.
Green Cove, FL 32043



The Bald Eagles 45th Reunion

photos by Lee French



Bob Hunter and Phil Reardon



Ed Moke and Dave Wilson



Val Yarbrough, Guest Speaker James Bell, and Mamie Bell



Astronaut Wally Schirra



Scott White and Don Safarik



Zung and John Pierro



Dale Jensen, Ron Oglevie, and Jay Carey



Charter Member Julius Kany



Val Yarbrough



Zung Pierro and Les Lackman



Roger Holt, Ken Bloom, and Harry Scott



Ed Rosenthal and Jimmy Schmidt



Donna Black, Armetta Vance, and Ace Evans



Ed and Linda Hoffman



Leah and Hank Lacayo



Maxine Haun and Michel Juiff



Cathy Baker, Sam Iacobellis, Arthur Goudreault, and David Baker



Tom and Penny Ellis and Howard Chambers



Pat Cunningham



James Bell and Sam Iacobellis



Guest Speaker James Bell



Lola Sides and Mary Perreault



Sonnie Robertson

Contrails From The Past

by Ed Rusinek

Dear Ed,

The Spring 2007 edition was a damn fine issue. This has to be one of your best ever.

—Raymond L. Puffer, Ph.D. Historian, Edwards AFB, CA

Ed's Ans.: Thank you, Dr. Ray! It is easy when your authors have lived through the experiences they write about and our authors have, representing the very best that was North American Aviation.

Dear Ed,

My three-year old daughter is taking swimming lessons at a fitness center located in a strip mall where Building One stood in Downey. Building 290 is now painted dark blue and is a movie studio. The studio also erected a small neighborhood set with several full size houses, south of Stewart and Gray Road and west of Bellflower Boulevard. What is the status of the aerospace museum that was to be built on the site?

—Kenneth E. Ryan, La Mirada, CA

Ed's Ans.: On April 12, 2007, a groundbreaking ceremony was held at the Downey facility for the Columbia Memorial Space Science Learning Center and new Downey Park. The speakers were a number of local politicians, the Contractor and Dr. John Clark, the husband of the late Astronaut Laurel Clark, lost on board STS-107. There were about 250 people in attendance with about 30 former employees. I asked the Mayor of Downey why there wasn't even one speaker representing NAA/Rockwell and he shrugged in bewilderment. So much for recognition of our historical importance!

Dear Ed,

The letter from Paul Struck with Badge No. 745, should not imply that he was the 745th employee at NAA. Personnel would assign numbers previously used by terminated employees. I hired into Department 2 in March 1939 and my Badge ID was No. 3919.

When NAA moved to Inglewood in 1935, they opened the new production plant in June 1936 with 150 employees. In 1942, the "Foreman's Club" was formed, later changed to the "Management Club". Of the original 40 charter members, I am the only one left. I still have my gold card.

—Gene Hales, Stuart, OK

Ed's Ans.: Thank you, Gene, for clearing up the employee numbering system. Always good to hear from folks that joined NAA in the worst of times and the best of times.

Dear Ed,

I hired in to North American Aviation on October 1, 1940 and my assigned employee number was 000321. My early years were spent at LAD. Most memorable of those years was flying around the country in the back seat of a T-28B with Bob Hoover putting on air shows. Bob always took off with a high rate of climb!

After that, I alternated between LAD and EAFB-lead man on the X-15 at Edwards, building the XB-70 at LAD, back to Edwards, work on the B-1 at LAD, and back to Edwards. When Carter cancelled the B-1, I retired in October 1981. Now, I am 88 and enjoying life on the Mississippi Gulf coast.

—Walter Joyce, Gulfport, MS



Among the former NAA employees attending the Downey ground breaking for the Columbia Memorial were Dwight Woolhouse, Stan Barauskas, Tom Barrera and Ed Rusinek.

Ed's Ans.: I am sure that you read Gene's comment that employee numbers were not sequential but rather reused as employees left the company. Nevertheless, only a real NAA airplane lover would make those moves between LAD and EAFB. Walt, you represent the best that was North American!

Dear Ed,

The Ralph Wetterhahn article about the F-86 reminded me of my tour in Korea at Suwan AFB and the same problems we had with the drop tanks on the F-86E as Capt. Jabara.

In between missions, we crew chiefs had to assemble the pylons and attach them to the tanks for the next mission. The pylon contained a shackle, wiring, an air line and a fuel line. The shackle was the problem. It came to us with a plastic coating which was supposed to keep out dirt and moisture. Somewhere in transit, moisture got into the shackle and onto the shackle release lugs. During the missions, the aircraft flew at high altitude where the temperatures were below freezing. The shackles with moisture would freeze and the lugs would not fully open and release the tanks when the pilots wanted to jettison them. Several planes had to abort and return home. Also, when the planes would descend to lower and warmer altitude, the shackle moisture would melt away and the partially open lugs would release the tanks on their own!

Disregarding the few minor problems encountered, it was a privilege to crew one of the best aircraft ever built, the F-86E. Later, I went to work for NAA for thirty years. It was a great place to work and there were many outstanding colleagues.

—Art Moon, Torrance, CA

Ed's Ans.: We design for battle and then get "hung up" by a few drops of moisture. It is always amazing how some small aspect of Nature can ruin a man's best efforts!

Dear Ed,

I started at NAA in September 1940 on the night shift in the sheet metal group (called Pots and Pans). Three months later, in December 1940, I received an NAA bonus check. That was the last year it was paid. My serial number was #0000094. I retired in 1982 with more than 41 years of service. I am now almost 88 years old and I still remember those good old days.

—Joseph May (Mokslaveskas), Anaheim, CA

Ed's Ans.: With a seven-digit serial number, it looks like NAA was expecting to hire a lot of people. There was something special about working for NAA. No matter what your task was, it felt like it was your vocation.

Dear Ed,

I came to NAA in 1937, just out of high school at the age of 17, and sent for a two-week course on "How To Rivet" at a school located in the NE corner of the plant. I was then hired as Employee #2101 as a stamper in the Machine Shop Inspection Department at 40 cents an hour. Chief Inspector Bob Dawe and Asst. Chief Inspector Dick Hunter became my mentors and pushed me through almost all of the inspection tasks, culminating as Sr. Inspector Experimental on the XB-28.

In 1948 I left NAA to join the USNR, followed by enrollment at Kansas State College. I returned to NAA in 1950 with a degree and became a structural designer on the Navaho in Downey. Other projects followed and I retired in 1975 with 32 years of service plus 6 years in the USNR. Although, I probably am not the oldest, being #2101 should attest to my early start with the company.

—Jean A. Burrell, Sonora, CA

Ed's Ans.: As you can see from the other letters, the numbers were handed out as available. However, having started in 1937 makes you one of the early pioneers starting at NAA. God Bless!

SORRY, WE FOLDED!

As you noticed, your copy of the bulletin arrived folded! In accordance with the new postal rates, the bulletin would require first class postage plus an additional surcharge of $0.90 if it was sent flat. We might have agreed to pay the surcharge if this ruling was applied to all publications, however, the Post Office "judiciously" excused the large magazine publishers from this additional cost. Perhaps, it is because the Post Office has something in common with these commercial enterprises—they both are losing money! At any rate, we would rather pay the $0.08 to have the bulletins folded and pay only the first class postage. We apologize for any inconvenience to our readers.

Congratulations and Best Wishes to

Richard and Marilyn Allen
of Orange, California
celebrating their 50th Wedding Anniversary

Thomas and Dorothy Creighton
of Snoqualmie, Washington
celebrating their 66th Wedding Anniversary

Chuck and Bobbie Day
of Mesa, Arizona
celebrating their 60th Wedding Anniversary

John and Ione Lautenbach
of Homeland, California
celebrating their 65th Wedding Anniversary

George and Louise Page
of La Mirada, California
celebrating their 50th Wedding Anniversary

The Silent Majority

by Stan Guzy



SCHIRRA, WALTER M. "WALLY", 84 – of Rancho Santa Fe, CA passed away of a heart attack on May 3, 2007. One of the original Mercury Seven astronauts, he was the only man to fly in all three of NASA's earliest manned spaceships. In 1962, Wally became the third American to orbit the Earth in the Sigma 7 Mercury spacecraft. Three years later, he guided the Gemini 6 two-man capsule to a rendezvous with Gemini 7. In 1968, his Apollo 7 eleven-day mission restored the nation's confidence in the space program, which had been badly shaken by the Apollo I fire on the launchpad. A frequent and welcome visitor to the Downey facility, he left NASA in 1969 having logged over 295 hours in space. After graduating from the U.S. Naval Academy in 1945, Wally served with the Seventh Fleet and flew 90 combat missions during the Korean War. His passing leaves John Glenn and Scott Carpenter as the only Mercury Seven astronauts remaining. We were honored having Wally join us at the Bald Eagles Reunion in April. Wally is survived by his wife Josephine.

BALL, WILLIAM C., "BILL", 90 – of Fallbrook, CA passed away on April 6, 2007 after a long illness. Bill joined NAA in 1938, assigned to what became Manufacturing Engineering. He retired from the B-1 program in 1977 after 39 years of service.

BARRON, GEORGE B., 71 – of Los Angeles, CA passed away of pancreatic cancer on January 22, 2007. George served as an electrician/engineer in plant services.

BENSON, GARY D., 55 – passed away from undisclosed causes at Inland Valley Medical Center in Wildomar, CA on April 30, 2007. He worked for NAA/RI/Boeing for 28 years. His wife Christine survives him.

BERKHEIMER, HAROLD R., 77 – of Anaheim, CA passed away on April 13, 2007 after a lengthy illness. Harold earned an AA degree while working in Product Engineering at Rockwell International. His work included the Peacekeeper Program. Burial was at the National Cemetery in Riverside, CA.

BRANDON, ROBERT, 79 – died on February 19, 2007 from undisclosed causes. He served as an engineer on the Apollo Space Program. His wife Mary survives him.

DAVIDSON, RALPH E., 88 – of La Mirada, CA, passed away from colon cancer on March 9, 2007. Ralph worked on the Apollo, Space Shuttle and B-1 before retiring from LAD in 1983 with 21 years of service. He is survived by his wife of 68 years, Maxine.

EHRICH, GUY, 78 – passed away on March 7, 2007 from pneumonia and other lung complications. He worked at NAA/RI as a manager in planning at the Autonetics facility before retiring in 1992. Guy was a capable leader who was well liked by those with whom he worked. His wife Carol survives him.

ETHERIDGE, FREDERICK G., 84 – of Aliso Viejo, CA, passed away on February 27, 2007. Fred served in fluids and propulsion engineering at Downey and Seal Beach before retiring in 1986 with 45 years of service. His work included the Apollo, Space Shuttle proposals and numerous satellite projects.

EWALD, LORRAINE H., 60 – died in Arroyo Grande, CA on April 16, 2007 of a heart attack. Lorraine retired from Downey as a senior procedures analyst in Material after 28 years of service. Her loving husband Bob, also an NAA retiree, survives her.

FIELDS, WILLIAM V., 82 – died on April 26, 2007 in Homeland, CA. Bill retired from Rockwell International in 1987 after 32 years of service as a machinist.

FILIPPO, PAT, 76 – passed away on April 29, 2007, from undisclosed causes, surrounded by her loving family. Pat had worked at NAA/RI at Downey and Anaheim in the logistics organization for 33 years before retiring in 1990. Pat is survived by her husband of 58 years, Lou.

GALLEGOS, ALBERT N., 83 – passed away at his home on February 7, 2007 from complications of congestive heart failure. He worked for thirty years as a nuclear engineer for NAA/RI before retiring in 1986. His wife Elaine survives him.

GILBERT, JOSEPH L. "JOE", 76 – died in Placentia, CA on April 2, 2007. Joe served as a quality and reliability engineer at Autonetics for 23 years before he retired in 1996. He is survived by his wife of 49 years, Dolores.

GRANADO, ARTURO T., 80 – of La Mirada, CA, passed away on January 13, 2007 from complications of a lung disease. Arturo retired from Space Division in 1991 after 30 years of service. During World War II, he served with the Army in the Philippines and was present on the USS Missouri in Tokyo Bay for the surrender of Japan. Arturo is survived by his loving wife Carolina.

GYSBERS, JACK C., 88 – died at Encino hospital from renal failure and cancer on April 5, 2007. Jack joined NAA in 1957 with a master's degree in mathematics and worked on several engine/rocket programs at the Rocketdyne Division. Later, he was assigned to the RI Science Center until he retired in 1987. His wife of over 60 years, Ruth, survives him.

HAWLEY, GORDON E., 82 – died on January 26, 2007 from undisclosed causes in Lake Forest, CA. His career in aerospace and the manned space program spanned more than 20 years at NAA/RI/Boeing. He was a group leader and a mentor to a generation of engineers. He retired in 1984 only to work 18 more years as a consultant. His devoted wife, Dorothy, misses him.

HOWARD, ERNEST V. "ERNIE", 88 – passed away peacefully at home in Downey, CA on May 14, 2007. Ernie joined NAA at LAD in 1941 as an inspector. He worked on many major programs and retired with 40 years of service from Space Division in 1980 as a quality control engineer. He is survived by his loving wife Marge.

JOHNSON, FRED T., 85 – passed away on January 7, 2007 in Georgetown, TX after a long battle with heart disease. Fred retired from the LAD Hydraulics Group in 1979. He is survived by his wife of 60 years, Jean.

JOHNSTON, BETTY B., 75 – passed away quietly in Hemet, CA on April 24, 2007. She began her career with NAA in Downey in 1955 as a maintenance engineer. Betty retired after 33 years of service and moved to Hemet in 1988 to enjoy her family.

JONAS, CHARLES B., – died on December 28, 2006 from undisclosed causes. He retired in 1978 after 29 years of service as a graphic artist. Notification was made by an unsigned letter.

KEASEY, STERLING "BILL", 84 – died on January 29, 2007. Bill served in the Photogrametry Department of Quality Control at the Columbus Division when he retired in the early 1980s.

KELLETT, DUANE E., 86 – passed away in Templeton, CA on January 23, 2007 due to declining health. He retired in 1980 from Space Division after 41 years of service. Duane started as a riveter and worked his way up to a supervisory position. His wife, Lottie, survives him.

KRUEGER, ALLEN, 81 – of Fullerton, CA died from undisclosed causes on May 6, 2007. He was an engineer with Marine Systems before retiring after 45 years of service.

LAUBACH, GEORGE E., 82 – of Plano, TX passed away on January 13, 2007. George started his career with NAA in Downey and worked on the Navaho, Apollo, X-15 and Shuttle programs in the Environmental Control System. He later moved to Boeing in Alabama where he retired in 1986. His wife, Annabelle, survives him.

LECCO, LUCILLE S., 83 – died at home in Columbus, OH on March 21, 2007. Lucy retired from North American Rockwell after more than 30 years of service.

MARTIN, FRAN, – of Manhattan Beach, CA passed away on October 30, 2006. Fran served at LAD for 27 years before retiring in 1993.

McDONALD, ROBERT "BOB" L., 76 – passed away on April 8, 2007 as a result of complications associated with Alzheimer's disease. He retired from NAA/RI after 30 years of service as an engineer in senior management. His wife, Mimi, survives him.

McINDOO, DONALD, 77 – passed away on April 30, 2007 in Murrietta, CA from undisclosed causes. Don worked at the Marine Systems Division of Autonetics. The majority of his career, spanning almost 30 years, was in the Field Engineering organization where he was assigned to several key programs including the navigation systems for the Poseidon, Polaris and Trident submarines. His wife, Sylvia, survives him.

McINTYRE, GEORGE W., 85 – passed away in Aptos, CA on April 8, 2007. George served in the Navy during WWII and the Korean War. He joined NAA at Downey in 1964 as an engineer on the Apollo and Space Shuttle programs and retired in 1987 after 23 years of service. An Eagle Scout, he was a very active adult scouting leader and enjoyed backpacking trips in the Sierras.

PURCELL, ALLAN C., 90 – of Inglewood, CA passed away on January 10, 2007. Al retired from LAD in 1981 after 46 years of service. He is survived by his loving wife Lila.

REED, ORION H., 90 – died on Merritt Island, FL on March 15, 2007. Orion was the NAA Base Manager at Cape Canaveral on the Navaho program. He then became the Convair Test Conductor on the Atlas Program. His wife, Edith, survives him.

ROBERTS, JAMES E., – of Victorville, CA passed away from undisclosed causes on April 22, 2004. He retired from Autonetics in 1981 after 28.5 years of service. His wife, Hilda, survives him.

ROSSELLO, DANTE, 88 – of Long Beach, CA passed away on April 28, 2007. At NAA/Rockwell, he worked on the design of the Space Shuttle wing. He held two patents for reinforced insulation and core structure and had two tech briefs printed when he retired in 1983. He is survived by his wife of almost 60 years, Josephine.

SCHELL, R. KENNETH "KEN", 69 – died on April 3, 2007 at home in Cocoa Beach, FL after a brave one year battle with severe health issues. Ken retired in 1992 after over 34 years of service in Manufacturing at Downey and the Kennedy Space Center. He is survived by his loving wife, Billie Jo (BJ), also an NAA/Rockwell retiree.

SHELTON, JAMES M., 85 – passed away on March 6, 2007 in Torrance, CA. James served for over 30 years with North American Rockwell, primarily in the Tooling Inspection Department. He was a Dixieland jazz trombonist and performed all over Southern California.

SOKOLSKY, ARLENE L., 85 – died on April 9, 2007 in Torrance, CA after a long battle with heart issues. Arlene served for several years in NAA Materials at LAD. She is survived by her husband of 60 years, Oliver. He is also an NAA retiree.

STARR, CHAUNCEY, Ph.D., 95 – a pioneer in nuclear energy, died at his home in Atherton, CA of congestive heart failure on April 17, 2007. Dr. Starr still came to work six days a week at the Electric Power Research Institute, a non-profit consortium that he founded, until the day he died. A scientist on the Manhattan Project during WWII, he joined NAA in 1953 and became president of Atomics International. He visualized that within a span of 50 years, it was conceivable that a major portion of the heat and electricity required for cities would be provided by nuclear power plants. He is survived by his wife of 69 years, Doris.

WILSON, WILLIAM "BILL" H., 82 – of Columbus, Ohio died on April 26, 2007 as a result of injuries sustained falling down a staircase. Bill joined NAA/RI in 1950 and after a sterling career retired in 1986. His wife of 58 years, Nancye, survives him.

WOOLSTON, FRANCIS J., 71 – died on October 28, 2006 from undisclosed causes. Frank was a self-taught electronics design engineer working for NAA/RI/Boeing for over 35 years. His wife of 45 years, LaVerne, survives him.

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Some of the X-15 test pilots engage in a whimsical mood as they pose for a group photo shoot in the 1960s with their own captions. Left to right: Joe Engle, Bob Rushworth, Jack McKay, Pete Knight, Milt Thompson, and Bill Dana.

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION
Retirees Bulletin

Fall 2007

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THE CALIFORNIA BOOMERANG by Ed Rusinek



Painting from the Casey Law Collection

In 1944, the U.S. Navy devised a plan to station carriers near the Japanese mainland to provide fighter escorts for B-29 bombers. To mask their presence, the Navy proposed to use the North American Aviation P-51Ds fitted for carrier operations. On November 14, 1944 Navy Lt. Bob Elder flew from NAS Norfolk to the* USS Shangri-La *(CV 38) in the Atlantic Ocean in a special P-51D-5-NA, Aircraft No. 44-14017, named* "Seahorse". *He successfully performed five landings and takeoffs before returning to NAS Norfolk. The capture of Okinawa precluded the need for this type of air support. This unusual event was captured in the painting* "HOOK DOWN, TURNING FINAL" *by Aviation Artist Craig Kodera.

NORTH AMERICAN AVIATION
Retirees Bulletin

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DEAR NAA RETIREE BULLETIN SUBSCRIBER

As we compose this commentary, we mourn the loss of two fine gentlemen with the passing of John R. Moore and Ray F. Larson. Much is known of John as a pioneer in inertial navigation, avionics and management systems. However, even after "retirement", he pursued a broad range of technical issues including the latest medical breakthroughs. With his wife in the hospital at UCLA, his research uncovered that doctors at Georgetown had successfully regenerated new lung tissue in rats with emphysema using a special derivative of Vitamin A. With his seed money and encouragement, and $100,000 worth of drugs supplied by a pharmaceutical company, a research program began at UCLA which was expanded by the National Institute of Health into a 10 million dollar ongoing study. In this final year of his life he offered ideas for decalcification of heart valves and offered himself to start the treatment with some noted success. He also had a gentle sense of humor. Several years ago, I spoke to John Moore, the NAA test pilot, and asked him if he ever met John Moore, the President of Autonetics. He answered, "No. But every time I would be at a social gathering, people would get excited about meeting me until they found out I was John Moore, the NAA test pilot, and not John Moore, the President of Autonetics." When John was dying of prostate cancer, I asked this John to call him and cheer him up. John did call him and introduced himself by saying, "I always wanted to meet you because every time I would be at a social gathering, people would get excited about meeting me until they found out I wasn't John Moore, the test pilot."

In an industry noted for "killing the messenger of bad news", Ray Larson would always seek the solution to the problem rather than waste time finding a culprit to blame for the problem. He was a splendid person, an excellent engineer and an outstanding leader.

A few weeks ago we met a real NAA enthusiast, Casey Law. He has a stack of NAA photos which he has accumulated over the years. Many of the photos have no captions, but they are of BEAUTIFUL NAA AIRPLANES so we are going to periodically insert them just because they are there and we love them!

A few months ago, one of our retirees from the Columbus Division informed us that we never had any articles about the AJ Savage aircraft. Not to disappoint our good friend in Ohio, we have scoured the literature available and have put together a composite article about this unusual airplane.

In the mid-1970s, a group of brilliant minds from within the company and externally was assembled at Seal Beach to visualize how Space could be industrialized and utilized for the benefit of Mankind. Giving us some insights of what this group foresaw are two members of that group—Tom Logsdon and Chuck Gould.

In this issue, Cleve Kimmel continues with the second segment of his report on the X-15. His detailed explanation of the X-15 explosion on the test stand should make every design engineer and flight test technician take another look at their procedures. What appears so straightforward on the drawing board may be subject to interpretation with the actual hardware, leading to disastrous results.

As we approach the end of the year, we ask our readers to check their subscription end date located above their name and address. If it is DECEMBER 2007, your subscription ends with the Winter Issue. You would be doing us a great service if you would decide to renew and to do it early. At the end of the year, our Membership Volunteer, Sonnie Robertson, gets inundated with checks, address changes, special requests and inquiries. This would help us run a smooth operation with our small group of volunteers. Why not remember your friends, especially those that are bedridden or incapacitated, with a subscription gift for 2008? We will send them a note with the Winter 2007 Issue informing them of your generous thought! And the cost is so minimal.

Space Industrialization for the Benefit of All Mankind

by Charles Gould and Tom Logsdon

The following was the introduction to a briefing presented by Rockwell International in the mid-70s. "The OPEC countries are challenging the economic prestige of this country as profoundly as Sputnik 1 challenged our technological prestige in 1957. This economic challenge is real and measurable, and an even greater challenge is made to our moral leadership by the developing countries which will contain the overwhelming percentage of world population in the next century."

In the mid-1970s, the Rockwell Space Division at Seal Beach won a study contract from NASA called "Space Industrialization". Prior to that time, space activities were dominated by exploration (Apollo, for example) and military uses. Space Industrialization focused on direct benefits to people, and especially, the private, profit-making utilization of space, using the unique attributes of space and its environment. These included the vantage point, weightlessness, vacuum, perpetual motion, abundant solar energy, and isolation from the earth's biosphere. At the time, total revenues from space industrialization totaled only about $2 billion per year. Today, however, space industrialization pulls in more than $100 billion every year.

The contract, which spanned about three years, was managed by Chuck Gould, supported by Krafft Ehricke, Tom Logsdon, Albin Kazanowski, Scotty Gerber and several others (the late Krafft Ehricke was the youngest of the group of German scientists who, led by Werner Von Braun, voted with their feet at the end of World War II to be captured by America rather than the Soviet Union). Another supporter was a Rockwell employee, Bonnie Dunbar, who later became an astronaut. We also had about a dozen consultants, who were leaders in their fields, from outside the company and even outside the aerospace community. One of these was Gerard O'Neill from Princeton University, author of *The High Frontier* who later raised $55 million from private investors to help commercialize space.

During the course of the study, we looked some 50 years into the future and correlated human needs with space opportunities. At the beginning, we searched out meaningful trends in human needs; then we sought out practical and economically viable space opportunities to fill those needs. The list of attractive opportunities for beneficial space endeavors is shown in Figure 1. Later, we combined the opportunities into programs, whereby the hardware elements were conceptually designed, scheduled and costed.

As we proceeded to look into the hardware programs that could provide the intended benefits, we noted an overarch-

Figure 1. Attractive opportunities in the Services area

LAND DATA

Agricultural Measurements

- Soil type classification
- Crop measurement
- Crop damage assessment
- Global wheat survey
- Crop identification/survey
- Agricultural land use patterns
- Crop harvest monitor
- Range land evaluation
- Crop stress detection
- Soil erosion measurement
- Agricultural acreage survey
- Soil moisture measurement
- Soil temperature monitor

Forest Management

- Timber site monitoring
- Logging residue inventory
- Forest stress detection
- Forest fire detection
- Rural/forest environmental hazards
- Lightning contact prediction/ detection

Hydrological Information System

- Snow moisture data collector
- Wet lands monitor
- Tidal patterns/flushing
- Water management surveillance
- Irrigation flow return
- Run-off forecasting
- Inland water/ice cover
- Subsurface water monitor
- Water resource mapping
- Soil moisture data collector
- Irrigation acreage measurement
- Aquatic vegitation monitoring
- Underwater vegitation survey
- Lake/river suspended solids
- Flooded area monitoring

Land Management

- Land capability inventory
- Land use mapping
- Wild land classification
- Range vegitation mapping
- Rangeland utilization/ population
- Flood damage assessment
- Beach erosion

Pollution Data

- Advanced resources/pollution observatory
- Salt accumulations (irrigation)
- Agricultural pollutant monitoring
- Great Lakes thermal mapping
- Effluent discharge patterns
- Toxic spill detector
- Air quality profilometer
- Air pollutant chemistry (Freon)
- Pollution detection and distribution
- Mosquito control (wetlands flooding)

Resource Measurements

- Oil/mineral location
- Drilling/mining operations monitor

Geographic Mapping

- Urban/suburban density
- Receation site planning
- High-resolution earth mapping radar
- Wildland vegitation mapping
- Offshore structure mapping

WEATHER DATA

- Atmospheric temperature profile sounder
- Rain monitor

OCEAN DATA

- Ocean resources and dynamics system
- Marine environment monitor
- Oil spill
- Shoreline ocean current monitor
- Algae bloom measurement
- Saline intrusion

GLOBAL ENVIRONMENT

- Glacier movement
- Ozone layer replenishment/ protection
- Highway/roadway environment impact
- Radiation budget observations
- Atmospheric composition
- Energy monitor, solar terrestrial observatory
- Tectonic plate observation

Figure 1 (continued). Attractive opportunities in the Services area

COMMUNICATIONS

Information Relay

- Direct TV broadcast
- Electronic mail
- Education broadcast
- Rural TV
- Meteorological information dissemination
- Interagency data exchange
- Electronic cottage industries
- World medical advice center
- Centralized "distributed" printing systems
- Environmental information distribution
- Time and frequency distribution

Personal Communications

- National information services
- Personal communications wrist radio
- Voting/polling wrist set
- Diplomatic U.N. hot lines
- 3-D holographic teleconferencing
- Mobile communications relay
- Amateur radio relay
- "Telegraphing" personal communications systems
- Worldwide electronic ping-pong tournaments
- Central computer service (for transmitting hand-held calculators)
- Urban/police wrist radio

Disaster Warning

- Disaster warning relay
- Pre-disaster data base (earthquake)
- Earthquake fault measurements
- Disaster communication set

NAVIGATION, TRACKING, AND CONTROL

Navigation

- Global navigation system
- Global position determination
- Coastal navigation control
- Global search and rescue locator

Tracking and Location

- Implanted sensor data collection
- Wild animal/waterfowl surveillance
- Marine animal migrations
- Vehicular speed limit control
- Rail anti-collision system
- Nuclear fuel locator
- Vehicle/package locator

Traffic Control

- Multinational air traffic control radar
- Surface ship tracking

Border Surveillance

- U.N. truce observation satellite
- Border surveillance
- Coastal anti-collision passive radar

Attractive opportunities in the Products area

PRODUCTS

Organic

- Isozymes
- Genetic engineering of hybrid plants
- Urokinase
- Insulin
- New antibiotics via rapid mutation

Inorganic

- Large crystals
- Super-large-scale integrated circuits
- Transparent oxide materials
- Surface acoustic wave devices
- New glasses (including fiber optics)
- Tungsten X-ray target material
- Hollow ball bearings
- High-temperature turbine blades
- Separation of radioisotopes
- High-strength permanent magnets
- Magnetic bubble memory crystal film
- Thin film electronic devices
- Filaments for high intensity lamps
- Aluminum-lead lubricated alloys
- Continuous ribbon crystal growth
- Cutting tools
- Fusion targets
- Microspheres

Attractive opportunities in the Energy area

ENERGY

Lunetta

- Night illumination for urban areas
- Night illumination for agriculture and industrial operations
- Night illumination for disaster relief operations

Soletta

- Night frost damage protection
- Local climate manipulation
- Reflected light for ground electricity conversion
- Ocean cell warning for climate control
- Controlled snow-pack melting
- Stimulation of photosynthesis process

Other

- Satellite power system (solar)
- Fusion in space
- Nuclear waste disposal

ing trend that was emerging. In the early days of the space program, every effort was made to keep the space hardware small, light, and simple. In order to do this, the corresponding ground hardware and activities were massive, complex and expensive. This new trend, which we called "complexity inversion" would install large, numerous, and/or complicated hardware in space so that the units on the ground could be small, simple, inexpensive, and therefore widely proliferated-thus serving millions or billions of users. The space-borne GPS navigation system provides an excellent example of this. A swarm of 24 GPS satellites today, looping around the earth in a precise constellation, provides navigation signals to millions of users equipped with simple, small, inexpensive receivers.

As we conceived the space hardware that could provide the benefits, we laid out four major programs in detail. One of them consisted of a large 65,000-pound geosynchronous platform that could perform many services to users, including Pocket Telephones, National Information Services, Electronic Mail, Direct Broadcast TV, and Electronic Teleconferencing. Our concept of the geosynchronous platform is shown in Figure 2. It is interesting to note that, if the four geosynchronous platforms were in place today, a border, anywhere in the world, could be closed overnight.

Figure 2. Four geosynchronous platforms could provide Pocket Telephones (now cellular), Electroinic Mail, National Information Services (now the Internet), Electronic Teleconferencing, and Direct Broadcast TV to the entire Earth.

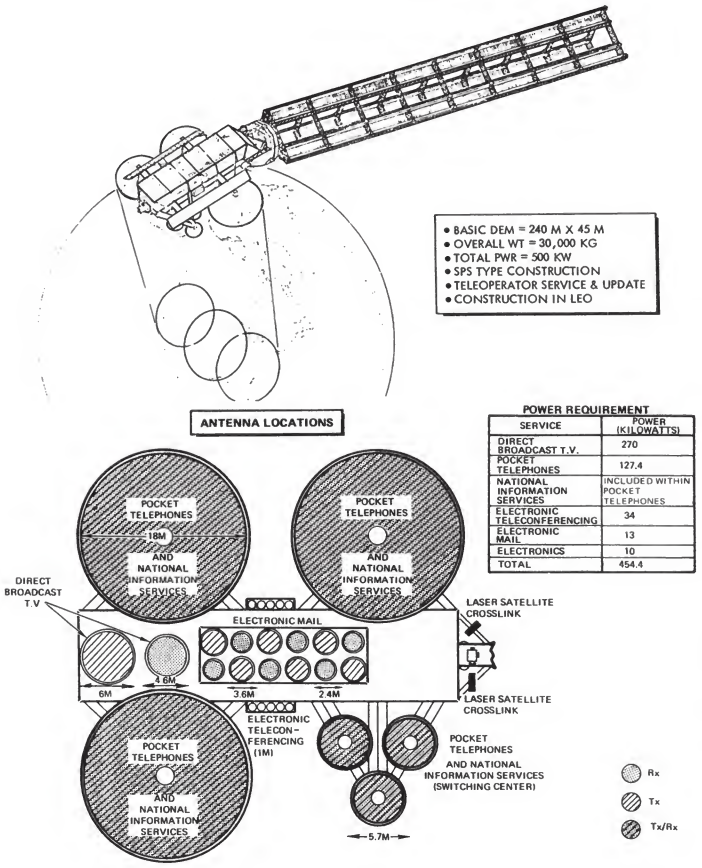
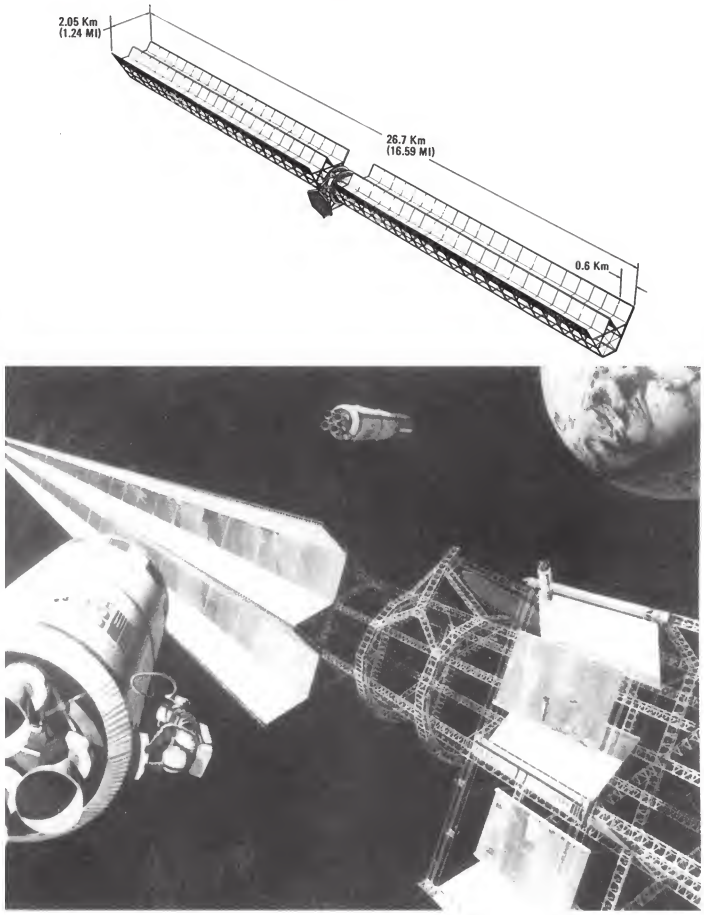


Figure 3. Solar power satellites convert sunlight to electricity and beam it down to terrestrial antenna farms. This concept could make the USA a major energy exporting nation.



Our "pocket telephone", was a rather primitive version of the ubiquitous cell phones now in use today which are supported by terrestrial systems. Our version communicated through the geosynchronous platforms.

We also envisioned a low-altitude earth observation platform that combined a variety of other useful functions-many of which are being accomplished today by separate satellites. We also studied manufacturing in space, in low earth orbit, utilizing large, solar powered space factories.

A major concept was a giant but thin "Solar Power Satellite". Each of these satellites, whose surface area is about the size of Manhattan Island, would provide twice the electrical power capacity of the Grand Coulee dam. The power would be beamed down to terrestrial antenna farms and then provided to normal electrical power distribution grids. Our concept for the Solar Power Satellites is shown in Figure 3.

Our studies also showed that, given a sufficiently reliable and cost-effective launch system, "Space Tourism" could also become an exciting and profitable component of space industrialization.

At first glance, our rather ambitious space industrialization program might seem unaffordable. But when these costs are spread over the enormous number of people who would benefit, the annual per capita expenditures would be quite reasonable.

Many of the societal benefits that the team envisioned 30 years ago have come to fruition, and Space Industrialization is now affecting billions of people. Moreover, the authors of this article, Chuck Gould, and Tom Logsdon, believe that many of these space opportunities are still out there, to be harvested someday, in some form, by the ingenious minds of Earth's six billion people.

About the Authors: Chuck Gould retired from Rockwell/Boeing as the Chief Engineer of Advanced Programs. Since 1962, he was involved in the conceptual definition of most of the manned and unmanned projects of three decades, including Apollo, Skylab, Shuttle, Space Station, the Global Positioning System, and other communications and surveillance satellites. Dr. Gould received his Ph.D. in Business from California Western University. He is a Certified Professional Manager and an Associate Fellow of the American Institute of Aeronautics and Astronautics.

Tom Logsdon worked at Rockwell International for 30 years on Apollo, Skylab, Navstar Global Positioning System (GPS), Mars and Asteroid missions and Space Industrialization. A talented mathematician, he performed optimal trajectory shaping, powered-flight maneuvers, fuel biasing studies, and various projects centering around mission analysis and planning. Dr. Logsdon recently received an honorary Ph.D. from Eastern Kentucky University where he delivered the commencement address. In retirement, he teaches courses on orbital mechanics and GPS Technology. Most of these courses are held at NASA and military installations.

The X-15 and Its People - Part II

by Cleve Kimmel

Throughout the early X-15 flight test programs, there were several mishaps or crashes that raised the concern about pilot vulnerability, and whether or not the vehicle was actually safe. Could we actually expect man to fly in a vehicle that was carrying so many hazardous propellants? As the aircraft came off the production line, they were tested by NAA, and then turned over to NASA, who assigned government pilots to fly them. The first government flight was in March 1960, just three months before the ill-fated explosion that ripped Ship No. 3 apart. During these early flights, it took about two weeks of preparation to get the plane ready for flight, and several flights had to be aborted near the launch site in Nevada because the LOX pressurization regulator failed to function. At that time, each abort cost about $300,000 and NASA was getting very perturbed about the situation. The NAA test crews and NASA engineers had been trying to resolve the problem for about a year before I was made aware of the issue.

The regulator had been originally contracted to the Whittaker Corporation for design and manufacture; but that firm could not fully understand the criteria, and they failed to produce. The regulator was brought in-house, and the NAA design engineers created the unit. It had to operate from -440°F to 600°F, and at pressures up to 6,000 psi. Occasionally, after "cold-soaking" the regulator in pre-flight/pre-launch condition for over 12 hours, it hung up and failed to open and pressurize the tank. Search as they might, the design team couldn't find the cause. In review of all the build records and test records of these regulators (by serial number), I discovered that the ones that always operated were re-built by one man in the NAA assembly and test department. All of the others had random failures. The problem was simple to fix after observing this man work. This individual was about 65 years old, a master craftsman, who also had a very bad case of the "shakes." His hands trembled and shook all of the time! This was the key; for you see, when he assembled the many small parts of the regulator, the shaking action actually smoothed out the many minor imperfections of the parts, making them fit together nicely, without any rough edges. I gave him a commendation, and instituted additional lapping (smoothing) operations into the assembly procedure, and the problem went away. All future flights were made without any regulator failure.

When I originally designed the regulator, I had it maintain the tank pressures at 48 psia, meaning that the pressure would be constant, regardless of the altitude pressure the X-15 might experience. This also provided the highest safety margin, because there would be one less sensing port that might get plugged up. The rate of tank pressurization was limited to the maximum rate of propellant discharge from the tanks to the engine feed system. Should the regulator fail open with the engine not running at full speed, the excess gasses and propellants would be vented overboard through either a vent valve or a reseatable burst disk. Due to the physical design of the ammonia tank, should there be a regulator failure, the fuel would have to be vented out of the valve, but not the helium and ammonia gasses.



Photo from the Casey Law Collection

Two of the fastest and most outstanding airplanes ever created by man stand side-by-side at Edwards AFB in 1967—the North American Aviation XB-70 Valkyrie bomber and the X-15A-2.

When ammonia is discharged to the atmosphere at altitude it will immediately start to vaporize, thus constricting the outlet, and reducing the effective flowrate. I designed the valve assembly to accommodate this condition. After release of the technical specification, it was NAA's position at that time, to have the valve design and procurement primarily handled by a separate engineering design and test department, rather than the in-house design and development department. In discussing the design with AiResearch, the selected valve manufacturer, it was decided by the NAA team that the technical requirement I created for the burst disc would cause ammonia to spill directly into the atmosphere was in error, and that this would be too dangerous. So they changed the pressure requirement, thereby allowing the manufacturer to design the valve so that both the relief valve assembly and the burst disc would vent through the same opening; thus compromising the safety of the tank. This change was not made known to me, until after an accident that blew up Ship No. 3. Still, the aircraft would not have exploded had the additional safety instructions I incorporated into the Pre-Flight Test Manual been followed.

With Scott Crossfield at the controls, and connected to the Rocket Thrust Stand at Edwards AFB, the pilot simulated pre-flight operations. When he initiated "Tank Pressurization", the pressure in the ammonia tank didn't stop at the prescribed value, but continued to climb. During this interval he attempted two engine starts, which were very rough. Within a short time the aircraft exploded. I was on company business, when I was directed to return and investigate the explosion. It had been over two years since I had any association with the X-15 program, and had never been to EAFB or the test site where the explosion occurred. I arrived in LAX, rented a car, and drove to the base. It was after 11:00 PM when I arrived, and the sky was black as sin; only little blue lights everywhere shone through the darkness. I finally made it there. Inside was a greeting that I never expected. The NAA X-15 Test Director, Bob Field, and all of the EAFB facility crews were awaiting me. The director made it very clear that it was my fault that the airplane exploded, and that his job was on the line for it. For over one hour he laid into me. After I had a chance to speak, he calmed down, I suggested we get a few beers and talk in the morning.

Reviewing the installation, it appeared to be evident what happened; the ammonia tank over-pressurized, causing the center section of the tank to break loose structurally, and impale the engine feed system propellant tank, initiating the explosion. The ammonia tank regulator could not operate because the pressure sensing controls had been bypassed when the ground crew had failed to remove the vent hose from the aircraft before test. This would not have happened had the design not been re-directed to place the system burst disk internal to the valve hose assembly and not externally by AiResearch as permitted by the test teams! I ran some calculations, and predicted the tank pressure rate-of-rise for the test. When the oscillograph recordings of the engine test were made available, they matched the analysis exactly! From that point onward, all the team members stopped the harassment. After a two week thorough investigation, I discovered the AiResearch design error caused by the NAA test teams redirection and recommended that in the future, the originating designer be the one to authorize changes, and also that the design engineering person be in the valve testing loop including approval of the test specifications. This was adopted corporate wide. The regulator was returned to NAA and rebuilt. No evidence that it had actually failed was ever found.

A classified meeting was held between the Chief Engineer, Harrison Storms; the X-15 Program Manager; Charlie Feltz and me. The setting was awesome! The meeting took place in the Chief Engineer's conference room, which could hold easily 20 people. He sat on one side of the table, Charlie and I across from him on the other side. The meeting was very formal and cold; you could feel the cold-blue electricity in the air. Both Charlie and I knew we were in deep, deep trouble. Stormy ignored Charlie and directed his attention to me, with the question, "What happened?" I gave him a complete run-down on the explosion and the findings that I had discovered to the best of my memory, indicating that the only reason for the over-pressurization and ammonia tank rupture that I was aware of, was due to the fact that the venting hose for the ammonia tank had not been uncoupled prior to test, and that the belief that the regulator had actually failed was incorrect. This hookup bypassed the ability of the regulator to properly sense the internal tank pressure, and it merely kept pushing more pressure into the tank until it ruptured. Stormy, looked at me, paused for a long while, and said, "That seems correct." Next he made a statement to Charlie that caused a shiver of fear to go down my spine.

"Charlie, two weeks ago we lost an aircraft, and it will cost us at least $6 million to repair; but that is not the half of it. We lost a lot more, our integrity has suffered! How can we regain NASA's trust in the people we have working on their programs, or the public's image of our company? Charlie, if you would look in the Test Manual in front of you for the engine run-up there is a clear picture of the hose that Cleve mentioned; and that the hose is shown to be required to be removed before start of the test. Also I notice that you did sign the manual, and required its provisions to be followed. Charlie, are you aware of this fact, and are you or are you not responsible for the $6 million dollar loss?"

Instant anguish spread through both of us, I was shaking like a leaf as was Charlie. Charlie looked directly at me, regained his composure, looked Stormy straight in the eye and said, "I reviewed and signed the test document, and I alone and no one else is responsible for not seeing to it that the test crew followed the directions provided. I have nothing else to say."

Stormy thought for a long silent moment, then said; "Well Charlie, we have an airplane to rebuild, go do it, and don't let this happen again." This feat of acknowledgment made Charlie a truly dependable man, and for this he was rewarded by later being assigned to the Apollo Program as its Manager and then President of the Downey Division! Through him the Apollo program was a success! I seriously doubt that any one else could have met the 1969 time-schedule deadline established by President Kennedy.

Additional investigations into the X-15 Ship No. 3 Explosion, and findings that remained a secret within (provided to me by James Clark)!

An explosion analysis team, headed by James Clark, was assigned to investigate the explosion (James and I attended several of NAA's in-house technical courses together). His team had the slow, time-consuming task of reconstructing the explosion

cause and sequence of events by examining the remnants, hoping to confirm earlier assumptions that ammonia tank over-pressurization caused this disaster. The debris field was almost ideal for this task. To the left and rear of the wreckage there were few obstructions, primarily barren soil that absorbed fragments without bouncing. The control bunker to the right was recognized as a potential source for deflecting parts. Likewise, the hanger building forward of the test site required immediate careful examination to identify the number and size of pieces and parts that dented or penetrated it's front wall, and search for items that made it through to the inside or fell to the base of the wall.

While the hanger and bunker walls were being examined, a grid work of reference lines was laid out on the surrounding ground, using the centerline and mounting face of the Test Stand as a datum. They also examined and photographed the fuselage wreckage from every possible angle and recorded any observations about evident specific damage features. Each grid square was first examined for any visible surface parts or materials. Each item was assigned an alpha/numeric identifier, photographed from at least two angles, the position carefully measured and recorded, and finally the item was carefully extracted and sealed in a tagged bag for later examination and identification. Then they carefully probed for parts hidden below the surface, like seeking a landmine. Buried items were carefully excavated to expose them for photography, their position and depth was recorded, and then they too were extracted and sealed in tagged bags. Only when they believed there was nothing left to recover, they would carefully rake the entire grid box area to confirm if any large items remained. Then all the soil was sifted through a fine screen to capture any small pieces that remained. Items located using final raking and sifting was usually assigned a position at the center of the grid box, lacking a better reference point. Teams worked inward from the perimeter of the debris field, and outward from the center. To minimize disruption of evidence, they only stood or kneeled in a grid box that had already been surveyed and cleared.

After all the field materials had been gathered, the team started the slow task of identifying the parts and materials in each bag to determine where it was initially located in the X-15. Sometimes visual inspection was sufficient. They often called upon design and fabrication personnel for assistance, or to confirm our identification. Sometimes they had to send items out for material analysis to identify the piece or part. Many larger or rugged hardware parts and airframe pieces had survived with various degrees of damage, but were still easily identified. They started with those easiest to identify and worked down to the harder items. As the task progressed, they began to recognize pieces that belonged to other assemblies and could usually fit many smaller items together. When they had identified about 60% of the tagged parts and materials, team members began creating a graphic illustration of the trajectory paths from ship source location to the impact point on the ground. They hoped for good, early correlation with most trajectories radiating from a primary core point, and (due to a relatively clear field area) did not expect to find many "stray" trajectories resulting from deflection from other structures. By the time they got to this point in the examination, there were already many causes being blamed for the initial explosion. One theory was Ammonia tank failure. One of the most prominent theories was that the tube forming the wall of the high pressure Helium tank (through the middle of the LOX tank) had failed due to over-pressurization, allowing the unrestrained rear end toroidal wall of the tank to "unwind", ramming the domed cap of the Helium tank into the adjacent spherical Hydrogen Peroxide tank causing it to rupture, which caused the front wall of the Ammonia tank to rupture, and then, with masses of LOX, H_2O_2, and Ammonia slamming together, you got a VERY BIG explosion. However, as the analysis progressed (much later than the initial fact-finding meeting with management) a far different point of failure began to emerge. Slowly but surely, the trajectories of parts and pieces indicated an explosive source to be at the center of the spherical Hydrogen Peroxide tank. Chemical analysis of residue on some parts initially located near that tank disclosed traces of reaction with H_2O_2, but no hint of ammonia or fire residue or exposure to high temperature, i.e., they were thrown clear prior to the fireball. Close examination of the test stand data indicated that temperature and pressure in the H_2O_2 tank had been rising VERY SLOWLY from the time it was filled. A minor rise was normal, but comparison to other tests under similar ambient conditions indicated that increases on that day were a bit higher than normal even though they were not high enough to raise concerns.

When Scott Crossfield fired up the engine for the first "Engine Burn", the vibration shook everything very hard. After engine shutdown, temperature and pressure in that tank continued to climb, despite the fact that the H_2O_2 was being consumed by the APU operation. Just as Scott proceeded to initiate engine restart for the second scheduled "Burn", the H_2O_2 tank pressure and temperature began to rise at a steadily increasing rate. Within a couple of seconds, just as the engine was lighting off, H_2O_2 pressure and temperature recordings went straight up, off the chart. An examination of data for both LOX and Ammonia tanks showed normal reading at the time this H_2O_2 event occurred. A fraction of a second later, both LOX and Ammonia data jumped off scale. However, the team was not yet prepared to present findings that so dramatically contradicted existing theories. If the H_2O_2 tank was the cause, we wanted to positively identify why it exploded. Structural tank failure was ruled out because it was not consistent with the temperature/pressure rise. Contamination was the likely cause of a chemical reaction that could have easily affected this unstable fluid. But we needed to determine the contamination source.

Since no parts related to the H_2O_2 tank had been altered or replaced since previous operations, the obvious place to start looking for a contamination source was the servicing process. The small diameter Hydrogen Peroxide (H_2O_2) service hose was very specialized. Like the hydraulic system hose, it had special fittings on both end connectors that allowed the entire hose assembly to be purged with dry nitrogen (to eliminate oxygen and other gasses) prior to passing fluid through the hose. As I recall, the working hydraulic fluid was a silicon-based product called something like "Orenite". If exposed to oxygen, silica, sand precipitated out. The H_2O_2 service hose was the first suspect, since fluid contamination in storage would have probably resulted in explosion of that storage tank shortly after the ship blew up. But careful examination of the servicing hose revealed nothing unusual. Then someone mentioned that this hose and fittings looked very similar to the hose that was used to service the ship hydraulic system. Examination of the hydraulic system

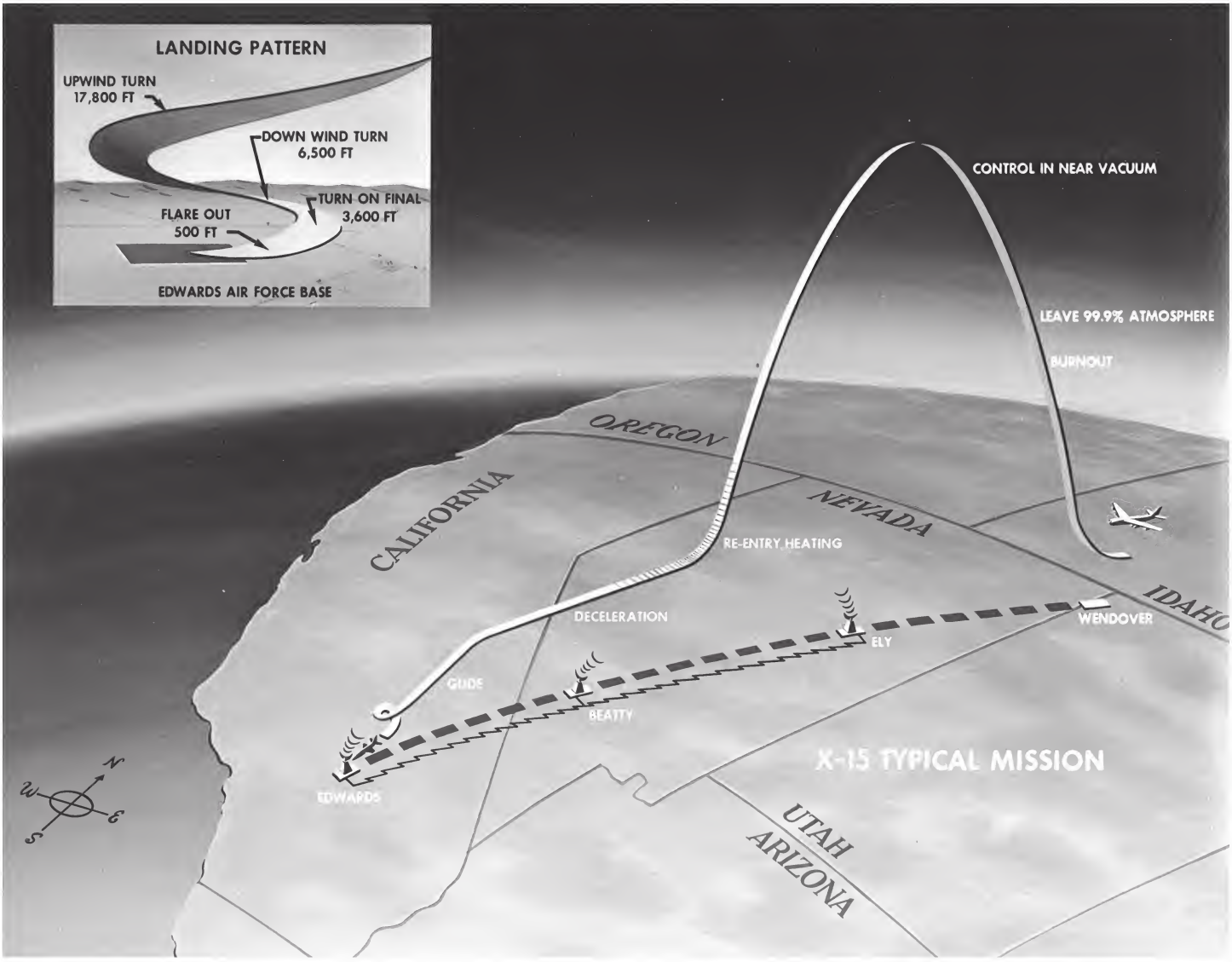


Photo from the Casey Law Collection

A graphic presentation of the typical X-15 mission flown with release from the B-52 Mothership over Idaho, climb to the stratosphere and reentry over Nevada, and landing at Edwards AFB in California.

service line produced a startling discovery... the service fittings were so similar that "Orenite" and Hydrogen Peroxide service hoses could actually be interchanged, with little effort being required to force them into the wrong couplings. SOMEONE HAD REALLY SCREWED UP! The hydraulic system hose did not have a protective lining designed to deal with Hydrogen Peroxide. Laboratory examination of that hose revealed damage consistent with prolonged exposure to H_2O_2. So it was clear that the hydraulic system hose was inadvertently used to fuel the Hydrogen Peroxide tank, and that error introduced one or more contaminants such as hose particles and "Orenite" residue from the service line. Contaminates laid in the bottom of the H_2O_2 tank and slowly a chemical reaction started to build, causing the very mild temperature and pressure increase. But the vibrations of the first "Burn" stirred up the mixture, and the reaction began to accelerate rapidly. Finally, the increasing temperature and vibration mixing resulted in a runaway reaction within the tank that pushed the pressure beyond the limits of the thick stainless steel tank walls and the H_2O_2 TANK EXPLODED, throwing parts in all directions. The team's scenario indicated that a front portion of the exploding H_2O_2 tank struck the rear end dome of the high-pressure Helium tank causing the supporting tube to crack and rupture. With no tube to restrain the LOX toroidal tank end bulkhead, it "unwrapped" spewing LOX into the mid-tank area. Then the Ammonia tank bulkhead was breached, pouring masses of fuel into the mid-tank area leading to the massive explosion and fireball. It's not clear what ruptured the Ammonia tank forward wall. A part of the exploding H_2O_2 tank likely got there first. But there was also some evidence that the domed end of the Helium tank, shooting aft like a powerful torpedo, also struck that bulkhead (which could not have occurred if the H_2O_2 tank was still in the way). Therefore, the conclusion in our report was that the exploding Hydrogen Peroxide tank caused this disaster, and that the explosion was caused "by contamination introduced through inadvertent use of the wrong service hose". The hose fittings were redesigned and replaced shortly thereafter to prevent any possibility of repeating this "Murphy's Law" error.

The airplane was rebuilt and an adaptive control system from the Navajo program installed. This also was later to prove costly to the program. The Air Force had just abandoned the hypersonic missile program, "Navajo". Salvaged from the

program were three "Adaptive Flight Control" systems. One went to the X-15 program and was installed into Ship No. 3. On earlier test flights, it had been proven that it was virtually impossible to keep the airplane headed in the correct position or direction while flying in the upper atmospheric regions through the use of the small attitude control jets positioned in the front fuselage sections of the airplane. Something better had to be incorporated, or else all high altitude flights would have to be abandoned. This, of course, would mean that the X-15 pilots could not receive their astronaut wings and, therefore, could not compete for a place in the Apollo flight program. The Mercury program and the X-15 were head-to-head in pilot competition; each trying to outdo the other. What the Adaptive Flight Controller did was to predict what the environment would be a few seconds ahead, and take corresponding steps to position the airplane properly for that position when it came. This was a continuous series of analysis and test feedback corrections, and it did work as designed. The unit was considered to be absolutely 100% fail-safe! In analyzing what was more important, "Man or Machine", the experts concluded that on the X-15 program, pilots were 92% reliable, while the machine was only 80% reliable. This finding eventually impacted the selection committee's thoughts when it was time to select the flight commander for the first Apollo mission.

Flying the airplanes was not always an easy task. No pilot could fly both the altitude course and the tracking course, even though they practiced many hours in the simulator and in the F-104. Major Robert A. Rushworth (USAF), in my opinion, after examination the flights was the best at it. He flew a total of 34 flights in the X-15. Later, he became Lt. General, and commanded the design center at Wright-Patterson AFB in Ohio.

John B. McKay (NASA), flying Ship No. 2, had to make an emergency landing at Mud Lake in Utah, when the engine failed to ignite. The aircraft rolled past the field limits due to faulty landing flaps, and the landing gear collapsed, swerving the airplane into a crippling high-speed rollover. The pilot crushed three vertebrae and lost 3/4" in height as a result. Within six months he was back flying! An in-flight fire in the engine compartment caused that emergency landing. John McKay activated the extinguishing system to put out the fire but indicators didn't confirm that it was out. So he initiated purging of fuel tanks and started a rapid descent for an emergency landing. Since the ship was very nose down for most of decent, a lot of the fuel remained at the front of the tanks and much of it was not dumped. So the ship was very heavy for landing. He also delayed release of the landing gear until just before touchdown. The pilot manual required gear release at least 10 seconds before touchdown.

The delayed gear release was the primary cause of the "back-breaking" landing. The added weight of fuel that could not be dumped in a "nose down" attitude simply added to the problem. The nose gear was actually a slightly modified standard nose gear assembly. However, it was never designed to be stored in a "wheel high" position (wheel higher than the trunion) as required by the X-15 wheel well design. When stored "wheel high" the fluid in the oleo shock absorber drained from the lower chamber into the upper chamber. Once lowered, the fluid would drain back down into the lower chamber in 10 seconds, ergo the requirement for the pilot to guess when to release the gear 10 seconds prior to landing.

When John delayed gear release, the gear came down but there was not sufficient time for the shock absorber fluid to fill the lower chamber. So the gear came down HARD, with almost no fluid and with the extra burden of a partial fuel loads. Test data indicated a nose gear shock of more than 12 g's. This broke the back of the ship, and shortened John's height by about 3/4 inch.

In examination of the crashed X-15's flight control system, it was noticed that there were two temporary manufacturing aids, Cleco fasteners, holding the main flight control cable in place. These fasteners were used to hold the part in position prior to the final riveting operation. The bracket supported a pulley wheel that was used to route and support the horizontal stabilizer control cable. After installation, this bracket assembly was buried in an inner area and completely hidden from further inspections. The crash opened up the area.

James Clark, designer of the system asked the inspector what changes were planned for the control cable mounting, and was informed that none were planned; this was the original design. James pointed out that the bracket was held in place by the Cleco clamp and could not possibly be correct. The inspector swore at James, stomped off to retrieve the original inspection records to discover who had inspected the area and signed off on the activity. James stood by his side throughout the search, out of curiosity. When the inspector found the entry he quickly slammed the report shut! When asked if he was the inspector, he admitted that he was. James then pointed out with a great laugh, and suggested that "He had just proven that an experimental aircraft could successfully fly numerous record breaking missions held together with Clecos instead of rivets." The error was immediately corrected.

James Clark redesigned the nose strut to retain the shock absorber fluid in the lower chamber while retracted, thereby eliminating the need for early gear release and the potential of landing without proper nose strut action. After the dust had cleared, Bob Field, the current Test Site Director at EAFB, discovered that the data recording systems were not turned on, so there was no data recorded about the in-flight engine compartment fire. He was so upset that he immediately issued a Directive stating that "Flight Test Instrumentation must be turned on prior to ANY In-Flight Emergency". We all (including Bob) had a good laugh over that Directive. How do you know when an in-flight emergency is going to happen so you know to turn on the recorders ahead of the event? He rescinded that Directive.

But that raised another question. How do you release the landing gear 10 seconds prior to a landing event that will occur at some future time? It's a guess based on experience, but a bad estimate could be disastrous with a nose strut that required 10 seconds to fill for landing. That's why NAA redesigned the strut to eliminate the guesswork. So Bob's silly Directive actually focused on the true solution to this problem. This airplane was re-built into a Mach 8 test vehicle by adding two external fuel tanks to it. It was my job to create the design and verify its operation. Howard Evans was the Program Manager for this activity; and later in 1967 I took over that job.

In the test program was a young NASA pilot named Neil Armstrong. His flights didn't go very smoothly, and he seemed to have more than his fair share of aircraft mishaps and problems; each one requiring all the flight skills he could muster to save the airplane.

Neil was selected to pilot the first high-speed thermodynamic re-entry test at low altitude. In this test he would accelerate to over Mach 3 at 80,000 ft altitude before engine burnout and try to keep the leading edges of the aircraft at their thermal limits. When the leading edges became too hot, he was to pull up slightly thus spilling some of his speed. Then he would push the nose down in a re-entry fashion until the heat again had to be relieved. This process was to be repeated several times between the launch site and the landing base. Well, not even the best laid plans go as planned. Just as he launched, the thermal conditions changed, and when he tried to re-enter after spilling off some speed, he couldn't penetrate the atmosphere. It acted like a steel cylinder, and he bounced higher up and at a higher speed. At this point the mission was aborted and Neil fought to save the airplane. Launch control engineers and he were in constant contact, all trying to find the problem and take corrective actions. There is only a 10-minute corridor of time before the landing site would be reached, and unless he got rid of the speed, he would have to jettison out, and lose the airplane. The X-15 was designed on the premise that the best environment to protect the pilot was the airplane itself. Ejection could not occur until the aircraft was flying well under 600 mph. At Mach 6, for example, the aircraft would have an aerodynamic drag force imposed upon it 25 times more strongly than at Mach 1.2. Also, the air temperatures would be about 1,200°F at Mach 6.

Neil elected to save the airplane, and at the same time take advantage of the extra altitude and speed to make that happen. Flying only on experience and knowledge of the X-15 flight characteristics (remember it flies like a rock) he continued to try to slow the airplane down sufficiently so that he could control its rate of descent. When he reached Anaheim, sufficient energy had been spilled that allowed him to regain control and turn the airplane around. He did this over Disneyland, and kept the plane aloft guiding it onto the reverse side of EAFB for a safe landing—a truly remarkable challenge. This gave him a joking reputation as not being able to do anything right by his colleagues, something I was told by other pilots that his wife really detested.

Neil's piloting capabilities were tested several times more by having to recover from launch site problems and perform extremely tough emergency landings, all without mishap. Because of his coolness under pressure I believe this to be the overriding factor for his being selected to be a member of the group of astronauts considered for the first manned mission to the moon. On one of these pre-test missions, Neil and fellow rookie astronaut Dave Scott were assigned to fly the Gemini 8 capsule around the world and land at a pre-designated site. Gathered at his house to watch this flight were all of his X-15 buddies and close friends. After a few drinks, one of the pilots said, "I'll bet Neil can't land within 12,000 miles of where he is supposed to!" This infuriated his wife so much that she wanted to mortgage their house to protect her husband's name. After the party regained control, and the anger dissipated, they all relaxed and watched the flight. This was the flight that had a Gemini system failure caused by the thrusters firing prematurely taking him off course. Neil had to take manual control, realign the capsule vector relationship with Earth (an extremely complicated maneuver using a make-shift sextant) and make an emergency splashdown in the western Pacific Ocean. He chose to land exactly halfway around the world from where he was scheduled to land, thus assuring he had the greatest amount of safety in survival. He landed some 12,500 miles distant from his originally planned location. It was this heroic feat that gave him the command position that eventually led him to be the first man on the moon!

The third and final segment of this X-15 story will appear in the Winter Issue of the NAA Retirees Bulletin.



NASA Photo

NASA Flight Research Center pilot Neil Armstrong in the cockpit of the X-15 in 1961.

Unleashing the Savage

by Ed Rusinek

On August 13, 1945, only a week after the first atomic bomb was dropped on Hiroshima, the U.S. Navy initiated a design competition for a carrier-based attack aircraft capable of delivering a 10,000-pound payload, which coincided with the weight of the "Fat Man" bomb dropped on Nagasaki.

The North American Aviation response, designated NA-146, was a large, high-winged aircraft, 63 feet in length with a wingspan of almost 75 feet. It was powered by a pair of Pratt & Whitney R-2800-44W air-cooled radial engines mounted in wing nacelles, each driving a large four-bladed propeller. An Allison-built General Electric J-33-A-10 turbojet was mounted in the rear fuselage. The jet engine was to be used during takeoff, for high-speed dash capability over the target or in the event of failure of one of the radial engines. The air intake for the jet engine was located in front of the vertical fin and was covered by a door which opened during operation. Interestingly, both engine types used the same fuel.

On June 24, 1946, the U.S. Navy ordered three prototypes under the designation XAJ-1. The aircraft was assigned the name Savage. Twelve production aircraft were ordered on October 6, 1947 and an additional 28 in May 1948. The first prototype, C/N 146-38429, was rolled out in June 1948 followed by the maiden flight on July 3, 1948 with test pilot Bob Chilton at the controls. The flight test program was not without problems-the other two prototypes were both lost in accidents due to structural failure.

The first production version of the Savage, the AJ-1, differed from the prototype in having a number of structural improvements. The number of crew members was increased to three. The wing tips and the vertical tail folded for storage aboard the carriers. The clear, sliding canopy on the prototype was later replaced by a fixed, framed canopy. Entry and exit to the cockpit was through a door located on the right side of the fuselage. Wingtip-mounted fuel tanks were added for increased range.

The first AJ-1 made its maiden flight in May 1949, with the initial flight tests conducted at NAS Patuxent River in Maryland and at NAS Moffett Field in California. The first carrier takeoff took place on April 21, 1950 from the deck of the *USS Coral Sea* (CVB-43). The first carrier landing followed on August 31, 1950.

The first squadron to receive the AJ-1 was composite Squadron VC-5, with deliveries starting in September 1949. Deliveries to Squadrons VC-6 and VC-7 followed. A total of 55 AJ-1s were built. Many AJ-1s were rebuilt as AJ-2s. The remaining AJ-1s were redesignated A-2A in 1962 under the new unified designation system.

The next production Savage was an improved version to be used for photographic reconnaissance. Initially designated the AJ-1P, it was created by converting a standard AJ-1, BuNo 124850. An order for 23 was placed on August 18, 1950, but by that time the designation was changed to AJ-2P.



Photo courtesy of the Boeing History Archives Office

A North American Aviation AJ-1* Savage *off the California coast. Early models of the AJ-1 were converted to air tankers. The AJ-2 that followed had uprated engines, a taller vertical fin, and non-dihedral tailplanes so evident in this photo.



Official U. S. Navy Photo

A North American AJ-1 Savage attack bomber aboard the straight decked* USS Oriskany *(CV 34) on August 29, 1952 off the U.S. West Coast in preparation for the first Korean War deployment by the carrier. With a wingspan of over 71 feet, the AJ-1 provided the U.S. Navy nuclear strike capabilities early in the Cold War.

The AJ-2P had a redesigned bomb bay to accommodate photographic reconnaissance cameras rather than bombs. The bomb bay was fitted for both down-looking and side-looking cameras, and had transparent areas for the camera lenses. The most readily noticeable difference was in the nose-the bulbous radar installation in the nose was replaced by a forward-looking K-38 camera. There was a fold-down access bay for the K-38, giving the aircraft a distinct "chin". Improved R-2800-48 and J33-A-10 engines were installed. The vertical fin was increased in height by a foot and made slightly longer. The elevators of the AJ-1 had a visible dihedral, but the AJ-2P had no dihedral.

The early AJ-2Ps had three crew members, with the third crew member being a camera technician located in the forward segment of the bomb bay. On later AJ-2Ps, a fourth crew member was added with an extra seat on the upper deck facing aft. The AJ-2P served with VJ-61 Squadron at NAS Miramar, California, VAP-61 on Guam and with VJ-62 and VAP-62 at NAS Jacksonville, Florida.

The improvements introduced on the AJ-2P were implemented on the new and improved attack version, designated as the AJ-2. The cockpit arrangement was revised with the throttles moved to a central location where all crew members could have access to them. The crew of three were all on the upper deck with the third crewman facing aft.

On August 14, 1950, the U.S. Navy issued a contract for the conversion of 42 of the original AJ-1s to the AJ-2 configuration. On February 14, 1951, the Navy ordered an additional 55 new-build AJ-2s. The AJ-2 served with Squadrons VC-7, VC-8, and VC-9 as well as with the heavy attack squadrons VAH-5, VAH-6, VAH-7, VAH-9, VAH-11, VAH-15, and VAH-16.

Although the AJ Savage had been originally built to serve as an attack aircraft, it rapidly became obsolete in that role as faster jet aircraft became available. Many of the Savages were converted into inflight refueling tankers with a hose and reel unit and extra fuel tanks installed in the bomb bay and the jet engine removed. The AJ-2 tanker aircraft served for several years with most of the heavy attack squadrons aboard aircraft carriers.

By 1960, most of the AJ Savages had been removed from active Navy service. In 1962, the surviving AJ-2s were redesignated as A-2Bs under the new unified designation scheme. Other surplus AJ Savages ended up in civilian service as fire-fighting aircraft.

From the Editor: It was recently brought to our attention by a Columbus Division retiree that we never covered the AJ Savage series of airplanes in the Bulletin. Since our good friend, Norm Avery, ended his splendid NAA reference book before the Savage came along, we had to resort to other references to complete this brief report on this splendid airplane.



Photo from the Casey Law Collection

A North American AJ-1 running up the engines prior to takeoff from the deck of the attack carrier* USS Midway *(CVB 41). During the 1950s the carrier operated in the North Atlantic waters in support of NATO.



Photo from the Casey Law Collection

An AJ-2 tanker providing in-flight refueling to an FJ-3* Fury *while an FJ-4* Fury Four *awaits its turn. All three aircraft were produced by the Columbus Division of North American Aviation.

Eddie and the Elephant

by Arthur Goudreault

Editor's Note: In the Winter 2006 Issue there was a short article about how a farm boy in Kansas helped Dutch Kindelberger resume his flight after an emergency landing and was offered a job with North American Aviation if he ever came to California. Here is the detailed story as remembered by Arthur Goudreault.

The farm boy was named Eddie Heiller and here is his story as he told it to me years later. Dutch Kindelberger was flying his own airplane across country to Mines Field (now LAX) when somewhere over Kansas he ran out of fuel and set the plane down on a dirt road. In trying to turn the plane around, the landing gear got off the road and he needed some help to pull the plane out of the mire. A young farm boy came down the road to see an airplane up close. Dutch asked him to get someone with a team of horses and some gasoline for which he would gladly pay. The boy went off and, I suspect, Dutch settled down in the shade and waited.

One can imagine his surprise when he saw the boy coming back leading an elephant. The elephant was carrying a number of cans of fuel. It didn't take long to harness the elephant to the plane, pull it back on to the road and refuel it. Dutch was very thankful, paid for the fuel and in the conversation, gave the boy his business card and told him if he was ever in Los Angeles and wanted a job, to give him a call.

Now, Eddie Heiller was a very enterprising young man. There were no elephant farms in Kansas, but every year the circus came to town and the owners relied on Eddie to provide them with a year's supply of tent pegs. During the year Eddie would scout the local farms and garages for scrap rear axles, most of which he got for free or for a few cents. The steel rear axles made great tent pegs for the large circus tents and at 50¢ each were very profitable. He also became good friends with the circus people, so when he came down one day to borrow an elephant, it was easily negotiated.

Some years later, after finishing school, Eddie came to Los Angeles and appeared one morning at an NAA gate and asked to see Mr. Kindelberger. The guard would not let him in until he showed him the business card. The guard called and Dutch remembered and received him. He sent Eddie to the Employment Office with a note to hire him. Eddie started in the Tooling Department and loved every minute of it.

In 1940, North American Aviation opened facilities in Kansas City, Kansas and Grand Rapids, Texas to increase aircraft production. Eddie, along with others at LAD, was asked to relocate to Texas to organize, implement and maintain the culture and methods of the North American Way at that plant.

After the war, NAA gave up the Texas site and returned to LAD. The Grand Rapids facility was taken over by Chance Vought in 1949 and, after several name and organization changes, became LTV Aerospace Corporation, Aircraft Division. Eddie Heiller stayed with the facility and was still working there in the 1970s and 1980s. He became well known in the industry as very innovative, honest and hard working and became head of the LTV Tooling Department.

During the B-1A development program, Rockwell was funded for production and early long-lead material and subcontract planning. We submitted a Production Make or Buy Plan to the USAF/SPO in Dayton and soon after started competitive bidding on the large structural assemblies we would procure in support of the production phase of the program. We received bids from all the major aircraft manufacturers at that



U.S. Air Force Photo

Rockwell International B-1A in flight.

time. We did bid analysis, onsite fact finding and prepared a recommended source selection. LTV in Grand Rapids, Texas was the selected source.

It was during the selection process that I first met Eddie Heiller who was part of the LTV team. We toured the LTV manufacturing plant during the onsite review and he showed us the tooling techniques that were unique and very cost-effective in riveting large assemblies. One operator was able to handle by hand a very large piece of structure and perform automatic riveting operations. Through the use of slings in moving the assemblies, marking the riveting holes on the structure and identifying the size of rivets to be used, the parts could be assembled in a fraction of the time and with far less manpower. The quality of the work was extremely high. Eddie had not only developed the concept but also the mechanisms for the automatic riveting machine heads which allowed a selection of different size fasteners to be used as the machine recognized the requirements. At the time, his methods and techniques were a quantum leap forward in automation.

On July 1, 1977, President Jimmy Carter halted the production of the B-1A. The development program, however, continued and we hung in there until 1980 when President Reagan reopened the program with limited funding.

During this time, Walt Sanders and I were visited by Eddie Heiller and John Dyer, the LTV Program Manager. Walt Sanders was the Rockwell Director of Major Subcontracts at the time. The substance of the meeting was that LTV had had a significant advantage in subassembly work using their automatic riveting processes, which they had developed and patented. They wanted to provide that technology to Rockwell for use on the B-1B as their contribution to make this program as cost effective as possible. Eddie Heiller said he felt he owed that to Dutch Kindelberger for giving him his career in aviation. I asked Eddie what it would cost us and he replied that nothing in life was free, so he would charge us $1.00 for the patent rights and for assistance in getting it started at our El Segundo, Palmdale and Columbus facilities. I decided it would not be prudent to try to negotiate a lower price. Walt Sanders and I drafted a one-page written agreement in my office.

I took them down to see Gene Ricketts, at the time Vice President of Operations and my boss. Eddie and John went over the deal with Gene and he felt it would be beneficial to the program. I told Gene to give them the dollar and both parties signed the agreement. LTV eventually built both the aft fuselage and the aft intermediate fuselage sections, did a great job on the B-1B program, never missing an aircraft on-schedule delivery.

Eddie Heiller retired from LTV not too long after the B-1B production program was going strong. The farm boy from Kansas, using a borrowed elephant to help a pilot flying to California during the Great Depression, had become an integral part of the history and success of the B-1B Program.

About the Author: Art joined NAA in 1959 in LAD Material. Over the years he rose in procurement management and became Vice President of the B-1B Material. With the conclusion of the B-1B program, he transferred to the Rocketdyne Division as Vice President of Material, which later became part of the Boeing Company. He retired in 1998 and is currently residing with his charming wife Sharon in Simi Valley, CA.

The Marine's Lament

We've fought on many a battlefield
across the world and back.
We're now engaged with terrorists
in Afghanistan and Iraq.

We're in a lengthy global war,
a fight to the bitter end.
Terrorists have vowed to kill us all.
We must not let them win.

We fight our battles anywhere,
from dawn to setting sun.
We fight with just one thought in mind
Our battles must be won.

But our bickering politicians persist
in thwarting us from within.
It would appear that many of them
do not want us to win.

"We are behind our troops," they claim.
"But this war can't be won."
So actually all they want to do
is turn tail, cut and run.

They do not stand behind the war
but they're behind us, they say.
We would prefer they stand in front.
For them we will make way.

We fear that their support for us,
while we're still in Iraq,
is not a pat on the shoulder,
but rather, a stab in the back.

It's not for any of them we fight.
We fight for what is right,
for the principles of honor and faith,
now fading fast from sight.

Shelby Forrest

Editor's Note: Shelby Forrest is a retired teacher and school administrator. He also retired as a full colonel from the U.S. Marine Corps Reserve. He flew Corsairs as a fighter pilot in both WWII and Korea. He resides in Upland, CA with his wife of 53 years, Gloria.



The California Boomerang

by Ed Rusinek

The day dawned foggy and damp at the Van Nuys Airport in Southern California. On the Air National Guard side of the airport, there was much activity as a ground crew swarmed over a North American Aviation F-86A Sabre. It was May 21, 1955 and the California Air National Guard 115th Fighter Squadron had recently exchanged its North American F-51D and F-51H Mustangs for some USAF F-86A Sabres and was redesignated the 115th Fighter Interceptor Squadron. The Sabres were six years old and USAF "castoffs". However, they were jets and a big leap forward over the Mustangs. In the hands of dedicated Air Guard crew chiefs, much attention was lavished on these new charges and they were soon in better condition than during their operating days with the USAF.

On this particular day, the ground crew was directing its full attention to a particular aircraft-North American Aviation F-86A, Aircraft S/N 49-4049. The airplane gleamed even under the dark haze of fog. Besides being highly polished, the airplane boasted a number of other modifications. Every rivet head had been shaved to make sure that it was perfectly flush-riveted. Every seam had been filled and smoothed, each panel had been fitted and refitted to assure that there would be no additional drag, and the six ports for the .50-cal Browning machine guns had been covered over with fabric, sanded smooth and then painted with aluminum dope.

The flight controls had been carefully rigged to fractions of a degree while the wing slats were removed and then refitted to ensure a perfectly smooth fit. The J47 turbojet had been removed, disassembled and then reassembled with all new parts where possible. Flight tests with the finely tuned Sabre were conducted to assure that all modifications were resulting in more performance. When they didn't, the airplane went back to the hangar for more work.

The reason for all this feverish activity came down to a young first lieutenant—John "Jack" M. Conroy of the 115th Fighter Squadron, 146th Fighter Wing, California Air National Guard. Conroy's military career began in 1942 as a B-17 pilot operating out of Britain. He was shot down on his nineteenth mission and spent the rest of the war as a POW.

After the war, Conroy moved to Los Angeles and joined the Air National Guard so that he could continue to fly. He had accumulated only 250-hours of fighter time when he came up with his daring idea. What Conroy proposed to do was to undertake a flight that would be more of a publicity stunt than a meaningful flight record. He wanted to have breakfast in Van Nuys, lunch in New York and dinner back in Van Nuys. His idea struck a positive note with his commanding officers who realized that the flight would gain a lot of media attention for the 146th FW—fondly known as the "Hollywood Guard"—and, in an era of budget cuts, this would not be a bad thing.

With approvals in hand, the ANG crew set forth to finely tune the Sabre. North American Aviation handled the expense of having the event timed as an official record and Maj. James Reid and his staff did an excellent job of obtaining radio, television and newspaper coverage for the flight. Special art was applied to the nose and the airplane received the name *"California Boomerang"*.

The 5,058-mile route was carefully planned with the flight from Van Nuys to Floyd Bennett Field, New York and back to Van Nuys. Two fuel stops were required for the eastbound leg and three for the return. Air Guard units would provide the refueling stops, done with the engine running, while the 27th Division Air Defense Command would provide navigational assistance.

The May 21st date was selected because it was Armed Forces Day. Conroy took off from Van Nuys on schedule and flew on instruments through the fog layer before popping out into bright sunlight and setting his course to the east.

Because of all the planning and preparation, the flight went smoothly and Conroy touched down at Floyd Bennett Field, grabbed a quick bite to eat, refueled, and was on his way west. The east-to-west leg of the flight broke the speed record set by Paul Mantz in his P-51C Mustang on September 3, 1947 during the Bendix Trophy Race. Mantz flew the 2,048 miles from Van Nuys to Cleveland at an average speed of 460.423 mph and this record still stands for piston-engine aircraft.

For most of the flight, the Boomerang flew at 40,000 ft and maintained speeds over 600 mph. With a large crowd on hand

Give me a sense of humor, Lord,

Give me the grace to see a joke,

To get some humor out of life,

And pass it on to other folk.

Congratulations and Best Wishes to

Tom and Ursula Eddleman
of Orange, California
celebrating their 50th Wedding Anniversary

Bill and Mary Lou Richtenburg
of Woodland Hills, California
celebrating their 50th Wedding Anniversary

Raymond L. Puffer, Ph.D. on his Retirement
from the Edwards AFB History Office
after 33 Years of Government Service

at the Van Nuys ANG ramp awaiting the return and, as the sun began to set, the Boomerang streaked across the field. Conroy had completed the coast-to-coast-to-coast flight, covering the 5,058-mile distance in 11 hours, 26 min, and 33 sec. After meeting with officials and the media, it was off to the Skytrails Bar across the airport for a celebration.

Editor's Note: This story began with collection of NAA photos provided by our good friend Casey Law. Among the photos was the photo of John Conroy and the California Boomerang. In investigating the photo further, we found the best details of the record flight in the August 2004 issue of Air Classics in an article written by Marshall Wainwright. Hence, here is the story to go with the picture!



Photo from the Casey Law Collection

Lt. John Conroy at Van Nuys Airport on May 21, 1955 in the F-86A Sabre, Aircraft S/N 49-4049, named the* California Boomerang, *poised to cross the United States twice between dawn and dusk.

The Silent Majority

by Stan Guzy



MOORE, JOHN R., 91 – a pioneer in inertial navigation, avionics and management systems died at his home in Sherman Oaks, CA. on July 13, 2007. He joined NAA in 1948 and was named President of the Autonetics Division in 1960. During this period, John also served as the first Visiting Associate Professor of Engineering at UCLA. In 1967, with the Rockwell merger, he became President of Aerospace and Systems Group of NAA/RI with responsibility for major components of the Apollo moon-landing program. He also served in many high-level positions involving corporate ventures. He left Rockwell in 1970 to become Vice President of Subsidiaries at McDonnell Douglas. In his career, he received 25 patents and wrote scores of papers on technical and management subjects. His awards and fellowships are numerous. Gifted with a prodigious memory for quotations and poems, he often wrote them as celebratory gifts for family and friends. He will be sorely missed.

CADE, DALE H., 81 – of Rancho Palos Verde, CA passed away July 26, 2007. He suffered from diabetes and had his left leg amputated earlier in the year. Dale retired from Space Division in 1989 after a 40-year career as a design engineer on the X-15, Space Shuttle and Submersibles. He is survived by his loving wife Ruth.

COLSON, GERALDINE, 86 – passed away on May 25, 2007 in Seattle, WA of pneumonia. She served for more than ten years as a tech writer at Autonetics.

ENNIS, PATSY ANN, 74 – of Desert Hot Springs, CA died on July 3, 2007 at the Odyssey House Hospice in Palm Desert. Her 40 years of service as an industrial engineer included a stint at Rockwell International.

FRUSHON, ROBERT A., 76 – of Prescott, AZ, passed away on June 29, 2007. Bob joined the U.S. Marine Corps in 1950 and served in Korea and Vietnam. He was the team captain for the Marine Corps Pistol and Rifle Team for 15 years. He retired from Rockwell International in 1990 as an aerospace engineer assigned to the B-1 Simulator. He is survived by his loving wife Barbara.

GOODIN, VAUGHN L., 84 – of Long Beach, CA passed away on July 28, 2007. Vaughn came into the aviation industry when as a young man he was given a ride while hitchhiking by the Chief Engineer of the Vultee Aircraft Co. in Downey. Starting as a draftsman, he advanced to electrical engineer and supervisor. He subsequently, transferred to NAA in Downey and was assigned to the Navaho, Hound Dog, Apollo and Space Shuttle programs. Besides serving at Downey and Seal Beach, he also worked at Edwards AFB, KSC, and the Redstone Arsenal in Huntsville, AL. He retired in 1978 after 27 years of service. Vaughn is survived by his loving wife Margie Mae.

GUERRA, EDWARD, 77 – died on May 13, 2007 of undisclosed causes at his home in Hemet, CA. Eddie served at Space Division as a draftsman for 25 years.

HALDERMAN, RICHARD C., – died of a congestive heart failure on June 4, 2007. Dick was a computer analyst and systems specialist at Autonetics. He is survived by his loving wife of 39 years, Betty Jo.

KELLEY, O. HAROLD, – died on November 19, 2006 from congestive heart failure in Columbus, OH. Harold retired from the Logistics Department at the Columbus Aircraft Division in 1976 after 35 years of service. He is survived by his wife Arlene, who is also an NAA retiree.

LARSON, RAY F., 86 – passed away on July 16, 2007 at home in Fullerton, CA after a brave battle with cancer. He and his wife, Pat, had just celebrated their 57th wedding anniversary on July 8, 2007. Ray served in many key engineering positions, including Program Manager for the Apollo-Soyuz project. He retired from Space Division in 1986 after 30 years of service.

LOVATO, RUDOLPH, 75 – of Orange, CA, passed away on June 29, 2007 of complications from Parkinson's disease. Rudy joined Autonetics in 1959 and retired in 1990 after 31 years of service. He worked on several programs, including Minuteman and Peacekeeper. He is survived by his wife of 45 years, Margaret Anne.

MALMUTH, NORMAN D., Ph.D., 76 – passed away at home on July 3, 2007 from complications of a long illness. He was an active leader in the fields of applied aerodynamics and fluid dynamics for over 45 years. He joined NAA in 1956. He received many awards, honors, and commendations for his technical expertise, the author of 120 publications, and held several patents. He is survived by his wife Constance.

McCLEARY, RALPH W., JR., 85 – of Rancho Palos Verdes, CA died of prostate cancer on November 22, 2006. He joined LAD as an assistant to Ralph Ruud. Ralph transferred to Space Division and served in Manufacturing and Facilities for 43 years before retiring as a supervisor in the Sheet Metal Department. He is survived by his wife Shirley.

MESSBARGER, FRED V., 75 – passed away on July 21, 2007 in Torrance, CA. Fred was a reliability engineer on the Apollo and Space Shuttle programs for over 30 years when he retired from Rockwell. He is survived by his loving wife Vivian.

MICHALIK, TED, 82 – passed away on July 27, 2007 in Norwalk, CA of stomach cancer. Ted retired from Space Division in 1986 after 32 years of service. He was a dynamics engineer assigned to the POGO problem on the Saturn V vehicle, and subsequently on the Space Shuttle program.

MILLER, AMENZO D., 91 – died from a heart attack on March 19, 2007. Amenzo resided at the Canyon Hills Club in Anaheim Hills, CA.

ROBERTSON, MAURY L., 95 – died in San Diego, CA on June 10, 2007. Maury retired as an Inspection supervisor at LAD in 1967. He is survived by his wife Velma.

SCIACIA, ANGELO A., 77 – of Reno, NV died in a single car accident in Gardnerville, NV. He retired from Planning at Space Division.

STACEY, RICHARD A. "DICK", 87 – passed away on July 24, 2007 in Tyrone, NM. He was a member of the North American Flying Horsemen and retired from LAD in 1977 after 40 years of service in Facilities Engineering. He is survived by his wife Elizabeth.

STEPHENSON, WILLIAM I. "BILL", 76 – died in Mission Viejo, CA on June 19, 2007 of cardiac arrest. Bill worked at Autonetics on the subcontract management team for the Peacekeeper Project for over ten years before retiring in 1993. He is survived by his wife Carol.

STEWART, JOHN H. "JACK", 86 – of Hawthorne, CA, succumbed on May 20, 2007 of complications following leg surgery. Jack joined NAA/LAD after a stint in the Air Force and retired from Tooling Engineering in 1980 after 33 years of service.

SUPONCHICK, KENNETH R., 88 – passed away on April 25, 2007 in Hemet, CA. Kenny joined NAA in 1940 and retired in 1979 after 38 years of service at LAD as an Inspection supervisor. He is survived by his loving wife Irene,

WIDENHOEFER, JOHN G., 82 – of Yuma, AZ passed away at home of a possible stroke on October 18, 2006. John retired from LAD in 1984 after 31 years of service.

WILSON, E. A. "GENE", 81 – of Camp Verde, AZ, passed away on April 5, 1007 after a long illness. Gene came to LAD in 1950 as a manufacturing engineer and retired in 1986 after 35 years of service. He is survived by his loving wife of 56 years, Shirley.

PAX DOMINI SIT SEMPER VOBISCUM

A Wake Up Call from Luke AFB, Arizona



Luke AFB is west of Phoenix and is rapidly being surrounded by civilization that complains about the noise from the base and its planes, forgetting that it was there long before they were.

A certain lieutenant colonel at Luke AFB deserves a big pat on the back. Apparently, an individual who lives somewhere near Luke AFB wrote the local paper complaining about a group of F-16s that disturbed his/her day at the mall. When that individual read the response from a Luke AFB officer, it must have stung quite a bit.

The complaint:

"Question of the day for Luke Air Force Base: Whom do we thank for the morning air show? Last Wednesday, at precisely 9:11 a.m., a tight formation of four F-16 jets made a low pass over Arrowhead Mall, continuing west over Bell Road at approximately 500 feet. Imagine our good fortune! Do the Tom Cruise-wannabes feel we need this wake-up call, or were they trying to impress the cashiers at Mervyns early bird special? Any response would be appreciated."

The response:

Regarding "A wake-up call from Luke's jets" (Letters, Thursday): On June15, at precisely 9:12 a.m., a perfectly timed four-ship flyby of F-16s from the 63rd Fighter Squadron at Luke Air Force Base flew over the grave of Capt. Jeremy Fresques. Capt. Fresques was an Air Force officer who was previously stationed at Luke Air Force Base and was killed in Iraq on May 30, Memorial Day. At 9 a.m. on June 15, his family and friends gathered at Sunland Memorial Park in Sun City to mourn the loss of a husband, son and friend. Based on the letter writer's recount of the flyby, and because of the jet noise, I'm sure you didn't hear the 21-gun salute, the playing of taps, or my words to the widow and parents of Capt. Fresques as I gave them their son's flag on behalf of the President of the United States and all those veterans and servicemen and women who understand the sacrifices they have endured. A four-ship Flyby is a display of respect the Air Force pays to those who give their Lives in defense of freedom. We are professional aviators and take our jobs seriously, and on June 15 what the letter writer witnessed was four officers lining up to pay their ultimate respects. The letter writer asks, "Whom do we thank for the morning air show?" The 56th Fighter Wing will call for you, and forward your thanks to the widow and parents of Capt. Fresques, and thank them for you, for it was in their honor that my pilots flew the most honorable formation of their lives.

Lt. Col. Scott Pleus, CO 63rd Fighter Squadron, Luke AFB

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Photo from the NAA Retirees Bulletin Archival File

In 1928, the Fokker Aircraft Company, a forerunner of North American Aviation, located in Passaic, New Jersey, utilized a two-horsepower vehicle to tow aircraft from the factory floor to the adjacent flying field. With the driver smoking a pipe, evidently ground operations safety was not considered an issue.

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION
Retirees Bulletin

Winter 2007

Wishing You a Holiday Season Filled with Peace and Joy

Inside:

THE SPACE SHUTTLE ORBITER
by John Young
THE X-15 AND ITS PEOPLE – PART III
by Cleve Kimmel
THE EXTENDED RANGE MUSTANG
by Lowell Ford
TRISONIC WIND TUNNEL'S LAST GASP
by Andrea Woodhouse
THE BATTLE OF PALMDALE
by Raymond Puffer



U.S. Air Force Photo

JOHN GEBHARDT IS SERVING IN IRAQ. This little girl's entire family was executed by the insurgents. They intended to murder her too, and shot her in the head...but they failed to kill her. She was cared for in John's hospital and was healing up, but continued to cry and moan. The nurses said that John is the only one who seemed to calm her down, so John spent four nights holding her while they both slept in that chair. The girl is coming along with her recovery. Editor's Note: In this holiday season when most of the civilized world celebrates the birth of a Child, we celebrate the saving of a child. May God Bless John Gebhardt and all those proud Americans serving their country around the world. May your season be filled with faith, hope, and health.

NORTH AMERICAN AVIATION
Retirees Bulletin

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Dear NAA Retiree Bulletin Subscriber

With this issue we come to the end of another year. It often amazes us at what we have accomplished with only five volunteers, and an incoming phone line and a mailbox at the Boeing Seal Beach facility. Of course, much of our success derives from the efforts of our splendid authors that have come forward to tell their stories. Often, these stories extend a window to events that have not been reported to the degree our authors have provided. As a result, several historians have requested copies of our bulletin to be archived in their libraries for future generations. This issue is no exception with articles about the Mustang, the X-15, the Space Shuttle, and finally, the closing of the North American Trisonic Wind Tunnel.

Astronaut John Young provides our first article written by a Gemini/Apollo/Space Shuttle astronaut with a critique of the first flight of the Space Shuttle in Space, STS-1. Cleve Kimmel concludes his penetrating and exciting three-part study of the X-15 program. Lowell Ford reports on the negotiations with the British Purchasing Commission before America entered the war and the preliminary design effort related to the building of the Mustang I for the RAF. Finally, an article by Andrea Woodhouse, reprinted from the Torrance Daily Breeze as a professional courtesy, on the closing of the North American Trisonic Wind Tunnel. The tunnel was donated to UCLA to be used as a university research facility, which never happened. Instead, it was rented to an aerospace company doing scientific research. Evidently, the hunger for money outgrew the need for learning! So much for making a donation to a major university!

The fourth B-1 reunion luncheon, held at the Golden Sails Hotel in Long Beach, was very successful with an overflow crowd of 225 in attendance. The speaker was Capt. Scott Higginbotham telling of his combat experiences as a B-1 pilot over Iraq and Afghanistan to a very appreciative audience. He is the second generation in his family to be a USAF B-1 pilot.

Our appeal for early renewal of subscriptions has hit a welcome chord and many of you have responded. However, if the date above your name and address on Page 20 remains DECEMBER 2007, this is your last issue. Please renew as soon as you can and save us the time and energy needed to mail out reminder cards. Thank you!

The 46th Bald Eagles Reunion Will Be Held on Saturday, April 12, 2008 at the Proud Bird Restaurant 11022 Aviation Blvd. (at 111th Street) Doors Open for Social at 10:00 AM Seating for Lunch at 12:00 Noon

Send your check for $22.00 payable to Bald Eagles Inc. to:

A.M. "Amby" Baccaro (310) 831-0945
3818 Stargazer Ave.
San Pedro, CA 90732-4529

Include with your check the name you wish on your badge and the name of each guest included in your payment. Tickets and badges will be issued as you register at the door. Tickets sold at the door will be $25.00. Sorry, no refunds after April 7, 2008. Order your tickets after the 1st of the year. But order early if you want preferred seating.

There are no service requirements to attend – just the love for Airplanes and Spaceships

Meet old friends—Make new ones!
Parking is limited—Carpool and Come Early!

The Space Shuttle Orbiter

by John Young, Captain, USN Retired

When the Apollo Program was over, then President Nixon along with the Department of Defense (DOD) decided we needed a new spaceship with wings to haul big payloads into orbit. It was decided to make the payload bay 15 feet in diameter and 60 feet long to haul a very large classified payload that supported the DOD.

On July 26, 1972, the STS Division of North American Rockwell in Downey, California won the contract to design and build the Space Shuttle Orbiter. Within months, I was using a T-38 to perform Shuttle approaches. In January 1973, we made our first trip to Los Angeles. We spent a lot of time at the Downey facility, working with some great engineers and technicians, helping to design the shuttle cockpit. One of our concerns was the sizes and shapes of the windows in the cockpit layout. The Orbiter has 42 systems, each of which was to be controlled from the Orbiter cabin. Our flight crews worked closely with the North American Rockwell engineers in coordinating the location of all the switches and software in the crew cabin. We laid out the panels for each system so that future flight crews could totally control the way the vehicle operated. To provide that capability, we made certain that all critical system switches and circuit breakers were located and installed where they would be accessible to the flight crews.

Needless to say, many meetings and design reviews were held. My flight log shows that I made 15 trips from Houston to Los Angeles in 1973. All of them were to support the early design layouts of the Space Shuttle Orbiter cockpit displays. The final configuration was then clearly defined in several publications such as the Aero Dynamic Design Data Book first published in May 1972 and the integrated vehicle configuration book called the Space Shuttle Definition Handbook, which showed and discussed in detail all of the Space Shuttle systems. It also listed the names of the NASA technical contacts and the counterpart North American Rockwell technical contacts.

The North American Rockwell engineers and technicians were living 24/7 with the design of the vehicle, working very closely with their NASA counterparts. For example, the Aerodynamic Design (Loads and Response Group) was headed by C. Warner at Rockwell and his NASA technical contact was T. Modlin. In those days, it was stated, "The Shuttle System is capable of a 14-day turnaround from landing to lift-off in 160 working hours, two shifts a day, five days a week for two weeks." You all know we never came close to that turnaround, but when we started, we believed we could do it.

Knowing what I knew about Shuttle approaches, I begged North American Rockwell to give us a subsonic lift-to-drag ratio of 5.0. They said the best they could do was 4.45. The STS-1 mission landing overestimated tile drag, so we actually achieved a 4.9!

Obviously from 1972 on, Downey was very busy. The Orbiter was being fabricated at Palmdale to be launched in 1978. That is when it was completed enough to be shipped to the Kennedy Space Center (KSC). When the Orbiter, now named *Columbia*, arrived at KSC, there was still a lot of work to be done. Working to an established schedule, KSC field personnel took on the tasks of completing all open work, testing the hardware at the subsystem and system level and, finally, rolling the orbiter out to the pad where the vehicle, now part of the Space Shuttle, underwent further testing and system checkout. To assist them in these preparations for launch, groups of engineers and technicians from Downey followed the Orbiter to KSC.

The intensity of the launch effort did not deter the will to constantly improve the vehicle. For example, in this same period, we introduced tile densification which increased the strength of critical tiles from 2-4 psi to 20-22 psi.

Bob Crippen and I were selected to fly the first Space Shuttle mission, STS-1. We ran a lot of all up end-to-end tests in the Orbiter. The first *Columbia* had ejection seats, which I am glad we didn't have to use. It was a great honor for Crip and I to launch in the Orbiter on April 12, 1981. From this initial mission, we had learned a lot.



NASA Photo

The first Space Shuttle mission, designated STS-1, was launched from KSC on April 12, 1981 with John Young as Spacecraft Commander and Bob Crippen as Pilot. The 54 1/2-hour, 36-earth orbit mission verified Space Shuttle systems performance during launch, on orbit and entry. One hundred thirty three flight test objectives were accomplished before the vehicle was successfully landed on the dry lakebed at Edwards Air Force Base in California.



NASA Photo

Shuttle Commander Astronaut John Young at the controls of Space Shuttle* Columbia *during the first mission, designated as STS-1.

Due to the underestimation of the Solid Rocket Booster motors' thrust and force loads, we staged very high. When we got to orbit, we had successful experiences in our opening and closing payload bay tests. Our Environmental Control Systems and orbiter radiators worked well. Unfortunately, our 10,000 pounds of Development Flight Instrumentation did not work due to a failed system on the middeck, which we could not access to remove and fix.

The Orbital Maneuvering System engines and the Reaction Control System engines worked very well. The Hydraulic System that controlled our elevons during entry was powered by Auxiliary Power Units. Those also operated well. These were the systems which we worried about for their ability to operate in zero gravity.

The entry was very normal except for an unexpected initial 4º of side slip, which automatically timed out before we got in the upper atmosphere. We felt very lucky. The rest of the entry was normal with the *Columbia* flying its normal 40º angle of attack to Mach 10 and then pitching over to subsonic angles of attack. I flew the *Columbia* manually around the Heading Alignment Circle and landed on Edwards Lakebed Runway 22. It was a great mission.

Dr. Chris Kraft said it best, "We just got infinitely smarter." At the time, we didn't have such things as all upwind tunnels at high mach numbers or computational fluid dynamics. So without all of the great work done by the North American Rockwell engineers and technicians, we would not have achieved the successes we had experienced. So many thanks for all you retirees.

About the Author: The name John Young is synonymous with the word Astronaut. After graduating from Georgia Tech, he joined the U.S. Navy and served on a destroyer during the Korean War. Sent to flight training, he served with Fighter Squadron 103 for four years. Completing test pilot training, he established several world time-to-climb records before reporting to NASA. Selected as an astronaut, he is the first person to fly in space six times from earth and one time from the lunar surface. His first flight in Gemini 3 with Gus Grissom was the first manned Gemini mission. His second was with Mike Collins in Gemini 10, where he completed a dual rendezvous with two Agena target vehicles. On his third flight, John was the Command Module Pilot of Apollo 10, with Tom Stafford and Gene Cernan, which orbited the Moon. His fourth flight, Apollo 16, with Ken Mattingly and Charles Duke, was a lunar exploration mission where he set foot on the Moon and drove the lunar rover. His fifth flight was as Spacecraft Commander of STS-1. His sixth was as Spacecraft Commander of STS-9, the first Spacelab mission. He has logged more than 15,300 hours flying time and 835 hours in space. His academic, aeronautical and astronautical awards and honors are too numerous to list. He was inducted into six Aviation and Astronaut Halls of Fame. John Young retired from the U.S. Navy as a Captain in 1976 after 25 years of active military service, and on December 31, 2004, he retired from NASA with over 42 years of service.



NASA Photo

The Space Shuttle* Columbia *glides down over Rogers Dry Lake as it heads for a landing at Edwards AFB at the conclusion of its first orbital mission.

The X-15 and Its People – Part III

by Cleve Kimmel

Editor's Comment: This third and final segment of the X-15 Saga concludes the article by Cleve Kimmel. We are grateful to him for summarizing all the details, good and bad, that were part of these fantastic machines and the visionary people that built them and the courageous people that flew them to the very edges of space. In these few pages he has evoked from us the entire gambit of human emotion with moments of great excitement, anticipation, elation, disappointment, pride and, finally, sorrow.

While NASA continued to fly two X-15s (Ships No. 1 and No. 3), the third one, Ship No. 2 which was severely damaged during its November 9, 1962 emergency landing, was being redesigned for Mach 8 flights as the X-15A-2. It would take two years to complete the design and manufacture; and new challenges would surface constantly. Incorporated into the design was the need to develop and test a liquid hydrogen scramjet at Mach 8. It was the Air Force's intent to determine if this type of propulsion could be used in hypersonic vehicles. The fuselage was extended some two feet in length, and provisions for the LH_2 (liquid hydrogen) installation were assigned to me. To complicate matters, the limited amount of LH_2 required a system design that was 100% liquid at the engine interface at time of engine test, without any cool down period. Such design conditions have never before been accomplished to my knowledge, and it was my task to "make it so".

I created a dual-segmented feed line that had two internally separate thermal conductors. Both annular jackets of this line were evacuated. The outer one reflected heat outward, the inner in reverse. Laboratory testing proved the concept. LH_2 during normal flow, would vaporize and create an annular ring about its surface; thereby, reducing the effective flow area. This condition was intolerable for the ramjet engine, and had to be eliminated. It was this tubing design that did the trick. To attach the tubing, cryogenic seals available at the time, from about 30 different manufacturers, simply didn't work. All claimed to have the perfect seal, but none of them would work in the -430°F range. The seals had to be simple and easy to replace. Most designs required very complicated attachment mechanisms. All leaked when tested. The seal design was pacing the program, and tubing fabrication couldn't start until the end configurations were established. Having no other alternative, we had to develop a seal. This was readily accomplished by adapting the old city water techniques for hydrant systems. Some of these systems used annular rings cut into the mounting flanges. Changing the shape of the rings to a 120° slope, and cutting them .010 inch deep solved the problem. A .010 inch thick Mylar flat gasket was made, and clamped between the two joint end pieces. It worked perfectly. The joint connection was then designed for thermal conformance to the same requirements as the line itself, and manufacture was under way.

To test the tubing, required two new items: how to see what is happening in the tubing, and what was the actual temperature. The first was accomplished by inventing a "see-through" port constructed of a Plexiglas type material, and thermally shielded from heat radiation. It was connected to high-speed cameras that picked up refracted background light from a light source fed into the port, thus providing a clear image of the liquid flow conditions. Although we didn't recognize this feat as of any particular importance; about 10 years later the "fiber optics" innovation shook America with introduction of light transmission cables. These were the next generation of the light transmission port that I had earlier invented. The second was inventing a thermal couple indication system that accurately measured the tubing wall/LH_2 interface temperature.

After six months of thermal measurement investigation, it was discovered that apparently no one had ever been able to accurately measure dynamic temperatures in the -430°F region and lower. It was vital to the engine test that accurate temperatures be known. To accommodate the need, I constructed a diffusion bond between the thermal couple tip and the stainless steel tubing wall. Accurate temperatures were recorded when the diffusion bond was created within 10% penetration of the inner wall of the tubing line. Thermal response measurements were found to be virtually non-existent. Patents were filed for both, but never issued as the application was thought to be too limited. It wasn't until a decade later that the invention of "fiber-optics" emerged. The little test port we used was the forerunner of that invention, but it was not recognized as such at this early time.

To allow the aircraft to attain Mach 8, additional fuel for the XLR-99 rocket engine had to be provided. It was determined that aerodynamically the only alternative would be to add external stores of fuel, and drop these storage tanks after the fuel was expended. These tanks would have to be separated from the X-15 under about a 6-g force, and at a speed under Mach 4. While others worked out this problem and established the dynamic forces at time of ejection, my task was to create a feed system that allowed the use of all existing components to the maximum extent possible, since money was very tight and weight was at a premium.

The major design problem was how to squeeze double the amount of helium into the airplane. The original helium tanks had been designed to operate at 3,000-3,600 pounds of pressure, with a safety factor of three. The regulators and all system components in the main pressure lines were designed to operate up to 3,600 psi. It was suggested to management that by reducing the helium bottles safety margin to one and a half at room temperatures, and at nearly 2-1/2 at -300° this could be accomplished. I believed that the current state-of-the-art was such, that the bottles could be fabricated very reliably to "burst" at precise conditions, not merely "over" some stated value, which was the practice at the time. New bottles were fabricated and tested. The design criteria were that the bottle had to burst at precisely 9,000 psi. Excess weight by overdesign could not be tolerated. When tested, the bottle burst at 9,023 psi. Getting the helium into the bottle proved to be more difficult than anticipated. Very little research had been done with helium gases at 6,000 psi and -300°F conditions. Unless the gas was at this initial condition, the flight couldn't be made, since there would not be sufficient helium to pressurize the propellant tanks. Several attempts to fill the tank failed to produce the mass of helium required. According to all of the entropy charts available, it should have been there! Even after three days, the pressure remained at 6,000 psi, and the bottle temperature was at -300°F, so where did the mass go? Strangely enough, when



NASA Dryden Flight Research Center Photo

X-15 No. 2 (S/N 56-6671) is shown with two external fuel tanks added during its conversion to the X-15A-2 configuration in the mid-1960s.

we measured the temperature inside the tank, it was discovered that the gases compressed into separate thermal layers, much like layers of cake, each about 10 inches thick, with some helium temperatures over 200°F. The gas bottle was about 9 feet long, and 16 inches in diameter. These thermal layers had virtually no thermal conductive properties, and as a result, they would not mix! The program couldn't afford an elaborate mechanical mixing system, nor could any recirculation system be added. By modifying the filling system such that the helium was first cooled to -320°F before filling into a -320°F pre-chilled bottle, and keeping the bottle chilled by circulation of LN_2 for 24 hours afterwards, the design goal was met. NASA technicians designed, tested and built the modified servicing system.

To accommodate the need to retain the existing helium tank pressure regulators and other major pieces of equipment, it was necessary to design a system that prevented the 6,000 psi helium from reaching these devices during operation. The main system requirement was that the rocket engine had to have a steady pressure available at all times. This meant that the system pressure couldn't be transferred from external to internal; but that in reality they had to be from the same source. This meant that the 6,000 psi helium had to be made available to the regulators that could only withstand 3,500 psi. Flow restrictors with pressure limiting controls were added between the bottle and the regulators, to keep the pressure at 47-1/2 psi during flow. They could not be configured to totally stop the helium flow during periods of nonuse. This required that a 100% positive zero-leak valve be designed to close off the helium supply until time to use it arrived. Easier said than done-for in the late 1950s, such things were not found lying about. The Marotta Valve Corporation was selected to design the valve, and after seven months of effort, they had one available for test. Needless to say, it failed miserably. Upon closer examination it was determined that the main closure device was a self-balancing poppet, and as such it would never operate. In discussions with their chief engineer, he stated "I've designed valves for 25 years, and that poppet is not balanced". Then, when asked, "So, why doesn't it work?" he responded, "The aircraft design was all wrong." With that understanding their contract was terminated. Good things do happen though. Simply by accident, Consolidated Controls Corporation heard of our dilemma, and said they had a valve "off-the shelf" so to speak. To support the Atlas Missile program, they had designed a zero leak helium shutoff valve that operated in almost the exact same thermal and pressure environment as the one needed for the X-15. This was their qualification unit. It was retrofitted, tested and delivered within two weeks. To attach it onto the pressure bottle, I used the same technique as developed earlier for the LH_2 line. After many rigorous tests, it was verified as flight acceptable. Throughout the life of the airplane, there were no failures.

Design systems for aircraft installations are normally created as two-dimensional drawings that show just small portions of the total picture; and as changes to the design are made, little sketches are attached that depict the new version. It was up to the installers to figure out what it looked like with the "attachments". This system didn't sit right with me, so I created a 1/4 scale 3-D drawing of the entire fuel and propulsion and pressurization system. There were so many parts to the system that in order to tabulate those for procurement would mean that at least six months of manual sorting and collating would be required. Having had previous access to the IBM 7090 computer, I decided that the computer would be used to create a Bill of Material (listing of the parts needed to make the system). What a shock! The computer could only perform simple calculations. The engineering, accounting and management principles had not been created by this time; and Fortran 2,

the newest version of programming language available for the computer, could not accomplish the sorting and tabulation of the thousands of part numbers in the system. Having already committed to do it, I found that by using "core" language, coupled with the alphabet and numerical hierarchy required, it could be accomplished. Two weeks later, the computer group personnel had created the first "alpha-numeric" computer sort routine for my use. As of this date I have not seen any other program computer spreadsheet program that can accomplish this feat. The existing programs invariably get the sort backwards, and intermixed with the incorrect sequence (e.g., 1, 11, 111, 2, 3, etc; instead of 1, 2, 3, 11, 111, etc.). This is due to their partial use of the ASCII identification table for reference. The computer personnel who created this matrix were exceptional.

The pressurization system was designed so that the main tank pressure regulators sensed the internal tank pressure, but delivered the gas flow to the external tanks for expulsion of their propellants. After external tank drop, it reverted back to internal pressure flow. This allowed the engine feed inlet pressure to remain constant. After the external tanks were empty, an indicator light on the pilot's cockpit panel would illuminate. This was his signal to eject the tanks. This action also closed a valve that separated the two-tankage systems. There was a 10 second safety margin built into the transfer to accommodate pilot reaction times. If the transfer did not occur within that time span, the main engine would shut down automatically. This could prove disastrous for the pilot and plane since the external tanks were designed to be ejected with forward thrust.

The start of the problems occurred when we selected a valve manufacturer, BH Hadley Company, to fabricate the 6-inch diameter butterfly shutoff valve to be used between the two LOX tankage systems. After delivery to NAA, when tested it failed to operate. It could be opened, or it could be closed, but not both in sequence. Their field engineer arrived at EAFB to examine the valve, and was amazed to see it "stick". He tried taping the actuator with a pencil, and each time he did so, the valve operated! After about 20 times of repeating this action, he stated, "I can't see that anything is wrong with the valve!" Three of us had to restrain the Air Force's test site manager from strangling him. We canceled their contract, and re-examined the design. The unit had a "rack & pinion" style actuator, and analysis indicated that when subjected to a 500°F thermal change, the teeth in the rack did not quite match those in the pinion. It required thermal compensation to operate. By replacing the rack with material compatible with the pinion, the valve operated perfectly; and after six months of intensive testing, it was placed into the airplane.



NAA Photo

Cleve Kimmel (left) is surprised at his desk in NAA-LAD Building #4 by a visit from NASA Test Pilot John B. "Jack" McKay in February 1967. Jack came to thank Cleve for his efforts in making the X-15 safe. He had logged 29 flights in the X-15.

Unsuspecting as I was, when it came time for the first real flight of the external tankage system, NASA assigned me to "man" the engine flight control panel. There are about a dozen different control panel operators in the flight control center, but this panel was the only one with command override control for mission abort—all of the others had to be directed through the control room flight director. I had the panel modified to reflect the new system, and since I was supposedly more familiar with the inner workings of the pressurization and propellant systems than the NASA engineers, it was felt that it should be my job to assure that all was okay. What an experience! With the external tanks mounted, the X-15 weighed a lot more than normal. Typically at DROP, the pilot would ignite the rocket engines within one second, never more. Based on that data, I selected 3.5 seconds for the margin of error in the initiation sequence; just to be on the safe side. On this occasion, the test pilot's reaction time was slightly over three seconds before engine start. I could see that this was going to be a rough ride for me. The pressures and engine RPM came up to design limits and remained steady.

After about 90 seconds into the flight the external tanks propellant supply was exhausted, and the empty light illuminated on my panel. This was a dual feed system, so the pilot had to also have the light in order for me to have a signal. I announced that I was ready to eject the tanks to the control room crews, but nothing took place by the pilot. We all watched in pain as the seconds drifted by; it seemed like an eternity for each one to pass. There were only ten of them available. If the pilot didn't eject the tanks before automatic engine shutoff, in all probability, according to aerodynamic analysis, ejection after engine shutdown could cause them to strike the airplane, and a crash was certain. The pilot, during this interval, unknown to the control room personnel, was having aircraft stability problems due to the slight shift in the center of gravity as the fuel was being depleted, and was trying to get the perfect heading for ejection. My finger inched toward the RED button that would end the test. If I pushed it too soon the mission would be aborted, but in all probability, so would the entire X-15 flight-test program. Skeptics in Washington at this point in time were still saying that manned flight into these aerodynamic regions was not safe or reliable, and they would have had a field day should the flight be aborted in such a drastic manner. In all probability the pilot may not have been able to control the flight with external tanks attached until the speed was reduced sufficiently so that they could be safely ejected. If I waited too long, the engine would shut down out of sequence and the immediate increased drag might destroy the plane in flight.

The RPM started to climb at about eight seconds of time, and was accelerating toward the RED LINE at 9+ seconds when the RPM returned immediately to normal. The pilot accomplished the external tanks ejection! My heart was pounding so hard, that for three days afterwards I couldn't close my eyelids. After the onboard oscillograph was read, NASA determined that the RPM was within three rpm's of automatic shutdown. My hesitancy and decision to "ride it out" and trust the pilot, probably saved the program, and I was feted as a hero having pure ''gut". None of them could believe that I was willing to go to the absolute design limit, with less than about 3 rpm remaining. They all stated that they would have shut it down within three seconds. To tell the truth, I simply couldn't believe that the pilot failed to react to the needs for switching and was awe-struck by the gravity of the situation!

After the X-15A-2 aircraft was again turned over to NASA, Lt. Col. Robert Rushworth was assigned to be the first military pilot to test the new system. On his very first flight, the LOX external tank failed to feed into the main tank. He was about 30 seconds into the flight when he shut down the engines, and jettisoned both external tanks. An emergency landing followed at Mud Lake. Since it was considered vital that the pilot know whether or not propellant was flowing from the external tanks into the inner tanks; I installed a flow switch to detect that function. When the flow switch light in the cockpit failed to illuminate, at the 30-second point in the mission; the pilot shut down the engine. The ejected tanks were recovered and sent to NAA for me to inspect and determine the cause of failure. Initially, NASA suspected that the pressurization system had failed, but I assured them that such was not the case. A quick analysis indicated that the feed line in the tank had to be blocked; thus preventing the flow of propellant. I had the lab personnel x-ray the tank, so as to get a view of the inner feed tube. Within an hour, the results were back; showing that the line had collapsed! This line was designed for five times the expected worse case pressure differential, but somehow it failed anyway. The line was replaced with another; and beefed up with external stiffening rings to eliminate a potential for recurrence of the problem. The main thing to remember was the x-ray technology available in the early 1960s for the Space Programs. The resultant pictures of the tubing were of such clarity, that I thought I was looking at the real tube!

With the return of Ship No. 2 to NASA for flight, having been rebuilt after John McKay's accident, new problems emerged that taxed the NASA flight crews. Normally, the aerodynamic flight differences were fed into the simulator, and future flights were routine with that airplane. However, it was now time to make way for the higher speed flights that required the X-15 to be covered with an ablative substance to withstand the high heat loads. This was the first application of such materials to a manned vehicle. A dummy-test ramjet engine was mounted on the lower ventral rudder to determine the effects that this shape might have on the airplane's flight handling characteristics. The dummy ramjet's shape actually approximated the real shape of the lower section of the ventral that was removed for the engine. The aerodynamic forces on the lower ventral (ramjet) were considerable, and the aircraft designers had it fastened to the fuselage by large Inconel-X framing members. It was behind these steel members that I had earlier in the design phase, connected the normal, secondary and emergency helium control pressure lines together. This flight had more than its fair share of problems:

Without the drop tanks, the NH_3 tank was filled by one servicing vehicle. It was normal practice to have this truck accompanied by a large water truck. Should there be a leak or fuel spill, water was needed to prevent the ammonia vapor from leaving the area. If breathed, the respiratory system in the body would shut down, and resuscitation could not revive that person. But, as usual in businesses, money became a concern, and when Ship No. 2 was being tested and two ammonia trucks were required to complete the fill; NASA could not afford the costs of having a water truck accompany them! Fueling took place usually about 3 a.m. The two trucks started out on a

totally black night. The front truck's rear brakes overheated and caught fire. The driver stopped, and both drivers tried to extinguish the fire with their fire extinguishers, both of which were empty! The flames started to grow, and spread to the ammonia tanks shell. By this time the flames were about 15 to 20 feet high. If the tank was breached, the ammonia cloud would drift, and all in its path would probably be killed. Seeing a light nearby, at an adjoining test site, the driver knew he could get water there. These two huge tanker trucks came roaring in at high speed to the lighted test area, one ablaze and engulfed in flames leading the way. At the test site was a modified F-111 airplane undergoing some top-secret tests, and armed guards, with orders to shoot, heavily flanked the area! The guards were stunned by what they thought was a terrorist attacking the site with a burning vehicle. With gun muzzles pointed at the driver's throat they ordered him to get out of there. The heavy tanker truck, having run over sand-landing mats placed there, had caused them to be wrapped about the tires and axles, and the truck was frozen there. Among all of the shouting and screaming, the driver finally made his point that he was only a driver, and that the tank contained ammonia, and he needed to put the fire out. The F-111 test engineers came to his rescue, and extinguished the flames. Base crews came and extracted the trucks, and they continued on their way.

Next came the flight test itself. Piloted by Pete Knight on October 3, 1967, the airplane accelerated to about Mach 6+, the flight controls apparently became a concern for the pilot, and we thought he had ejected the ramjet. Immediately he radioed back that he lost all pressure control, and couldn't jettison the remaining propellants. He aborted the flight and thought he could make it back to base, but that he would have to go straight into the landing strip. Normally, the airplane would circle the base, and then descend. It would be touch and go if he could make it. After landing it was discovered that when the ramjet was ejected, it left a portion of the rear end of the airplane unprotected from the environment. Searing heat cut through several inches of metal in a matter of seconds, severing the triple redundancy connection I placed there for pressure control, and burned a hole in the hydrogen peroxide engine feed system tank, burning it all. It was amazing that the pilot could have flown the plane, let alone land! The fuel system reverted to a fail-safe condition, and automatically discharged the remaining propellants from all tanks. This was the last flight for the X-15A-2. Investigation of the incident revealed that "shock waves" burned through the leading edge of the lower ventral and ignited the pyrotechnic charges that ejected the ramjet. Pete didn't eject the ramjet. This and the next accident finished the program, and the remaining airplanes were placed in museums. Ship No. 2 is on display in the National Museum of the United States Air Force at Wright=Patterson AFB, Ohio. It reached an altitude of 249,000 feet, and a top speed of Mach 6.7.

Meanwhile, Ship No. 3, the one that blew up on the launch pad with the first installation of its XLR-99 engine was being rebuilt, one of the adaptive control systems from the Navajo Program was installed. This was the Minneapolis-Honeywell-96 Adaptive Control System. This unit was designed to have a 100% reliability factor. As a safeguard, it also contained a circuit that if it detected a fault it would automatically shut down. With the unit installed and operational, the airplane could fly relatively safely into the upper atmosphere.

These flights, and many others like them, allowed some pilots to gain their Astronaut Wings. This was very important, since



NASA Dryden Flight Research Center Photo

Post-flight photo showing heat damage to the X-15A-2 following Pete Knight's record-breaking Mach 6.7 flight on October 3, 1967. Although Ship No. 2 was repaired and deliverd to Edwards AFB in June 1968, it never flew again. The X-15A-2 is now on display at the National Museum of the United States Air Force at Wright-Patterson AFB, Ohio.

that gave them additional status, and allowed them to be considered more favorably for other space flights. After President Kennedy announced that ***"We would put a man on the moon before the end of the decade"***, it meant even more to the pilots. Both the Mercury Program pilots and the X-15 pilots wanted a chance to be that first man! Virtually all of these flights were above Mach 5.

During these flights, stellar navigation systems and ground imaging systems were tested. These systems found their way into the U-2 and the Apollo. Horizon scanners, a new concept that collected light across the spectrum, was being developed to provide horizon control reference at extreme altitudes. Future guidance control systems on manned space flights would require such a device. Detection systems for micrometeorites and ionization trails were tested. The missile program was not forgotten. Secret tests using liquefied neon sensing systems were tested at high Mach numbers to determine if they could accurately deploy and vector control anti-missile-missiles. These missiles had tremendous velocity, and accurate guidance control was required. They worked great. While the remaining flights started to draw to a close, the lifting bodies were being conceived and wind tunnel models were being tested. These would be the forerunner of the Space Shuttle, and of course, broadcast weekly on the *"Six-Million Dollar Man"* TV series. These lifting bodies used the same identical Reaction Control's XLR-11 rocket engines deployed for the early X-15 flight tests. They needed more engines than were readily available on site, so they removed them from museums and display cases around the U.S. and pressed them into service.

One of the newer pilots to the X-15 program, Major Michael J. Adams (USAF) had one last chance to get his astronaut wings on Ship No. 3. However, the flight plan called for the altitude to be about 7,000 feet short of the requirement for the astronaut wings award! All of us suspected that he would let the engine burn a fraction of a second longer, and "simply over-shoot" the test altitude. Without those wings, he could never be considered for the Apollo program. On this fateful flight the aircraft started to wobble soon after launch, and Mike tried to steer it back to the flight path. He did shut the engine down precisely on schedule as ordered and as planned to do, much to the surprise of all of us "second-guessers", but nevertheless he still ascended to a very high altitude. The control room was deadly quiet, and you could almost hear each person's heartbeat. The communication from airplane to the control center was short, indicating that he had lost YAW control and was trying to correct for it by using the attitude control nose jets!

For this flight, NASA was conducting some additional guidance control system tests and had removed the YAW control from the airplane's true guidance system. It was coupled to the ROLL indicator (as I recall). If anything were to go wrong, all the pilot had to do was switch it off, and the attitude controls would return to normal. What everyone failed to realize was that after many hours of flight simulation for all contingencies—and then only a short briefing for this new switch operation—that once a failure occurred, the pilot would immediately reach back into his mind for corrective action. The override switch was clearly forgotten! The control room couldn't reach him to provide assistance. The pilot reported that the jets weren't working-YAW couldn't be restored. He applied full thrust to the jets, spinning the airplane like a top. All communication



NASA Photo

USAF Test Pilot Major Michael Adams was killed during his seventh X-15 flight on November 15, 1967 when at 230,000 feet with increasing dynamic pressures, the X-15 entered a Mach 5 spin.

was lost and we watched the attitude control of the airplane slowly recover as it descended into the atmosphere. All of us thought that when the plane "weather-vaned", that control would be regained. At about 70,000 feet, all telemetry was lost, and the rescue teams went out to find the plane. When the plane was located, we went to the crash site and recovered the body of the pilot. Replication of the flight, showed what had happened. This was the last time anyone tampered with the horizon controls! The pilot was buried in his flight suit. The crash was blamed on "Pilot Error", with which I disagree. This essentially ended the X-15 program, and the lifting bodies took over the spotlight. This truly fascinating program was officially canceled by USAF/NASA before 1968 yearend. I am proud to have been a small part of its history.

About the Author: After receiving a degree in Organic Chemistry from the University of Montana, Cleve enlisted into the Army and served for 3 1/2 years during the Korean War. Gifted with the ability to read and comprehend technical reports at 9,000 words per minute, he joined NAA in 1956 and was assigned to the Powerplant, Propulsion & Systems Group at LAD. He worked on various fuel and propulsion systems designs including the F-100, F-107, B-70, Navaho, Rocket Test Sled, Lunar Lander Simulator, Heavy Body Lift Buoyancy Transport, SST, and the X-15. He took early retirement at the age of 55 and currently resides with his lovely wife, Adonna, in Billings, MT.

The Extended Range Mustang

by Lowell F. Ford

After much tense negotiation, Contract A-250 for what became the British Mustang airplane was let on April 11, 1940. J.L. Atwood issued General Order NA-73 for the production of the British fighter on April 24, 1940 In this same G.O. he transferred all charges accumulated under Charge Number SC-1050, and the X73 company sponsored pursuit program to the NA-73 charge number. The X73 Prototype airplane now became known as the NA-73X Prototype airplane of the Mustang production Contract A-250 for 320 airplanes. It must be noted here, for research purposes, that "X73" was a valid and frequently used designation specifically for the Prototype airplane up to the end of its life cycle in December 1941. Another point is that until the fall of France, 300 of the contracted airplanes were for Britain and 20 were for France, according to information in Hap Arnold's records on file with the National Archives and Records Administration (NARA).

At the time France fell, all French business in the United States was transferred to the British and Lee Atwood issued a revised General Order on May 29, 1940 to reflect the twenty-plane increase for the British. What was the "Anglo-French Purchasing Commission" now became the "British Purchasing Commission" or "B.P.C.". The contract commitment with the British was to have a finished article 120 days from let of contract. The Prototype airplane, which was considered a secret project, was built in the Experimental Department under the direction of Carl Walterhoffer. Though the Prototype Mustang airplane was completed and ready for engine installation as early as August 20, the engine did not arrive until the first week of October.

Flight tests commenced on October 26 and eight flights were successfully completed before near disaster struck. On the ninth flight, with Test Pilot P.T. Balfour at the controls, the NA-73X experienced engine failure and crash landed in a bean field, to the west of the NAA main factory building, near Sepulveda Boulevard. Though the pilot escaped serious injury, the airplane suffered some structural damage when it nosed over in the freshly plowed ground coming to rest on its top side. The engine gear box and propeller were ripped off and there was damage to the upper deck of the fuselage, cockpit canopy, wing tips and tail surfaces. After being righted and returned to the NAA factory, the plane received a full inspection and was declared repairable. Work began almost immediately in order to return NA-73X to flight status as work on the NA-73 production line moved forward. The first production Mustang carried the British assigned number AG 345. It and the two which followed it, AG 346 and AG 347, were well into construction as the year of 1940 came to an end.

On December 21, 1940 the XX73 static test airframe entered into the static test program to determine structural integrity with respect to contract requirements and guarantees. As a result of the findings in these tests, the NA-73X, AG 345, AG 346 and AG 347 airplanes were disqualified from their roll as combat aircraft and relegated to flight test status. The NA-73X, AG 345 and AG 347 would be retained at NAA for flight test and AG 346 would have the distinction of being the first airplane shipped to England to be used for flight testing there.



Photo from the Lowell Ford Collection

The NA-73X being retrieved from a bean field west of the factory after a crash landing due to engine failure.

The board reviews immediately following contract approval were intense and led to pre-production design modifications which justified the mockup of the NA-73 as an invaluable research form, fit and function tool. Cockpit revisions were a main issue, since the airplane had been built to Army Air Corps standards. The control quadrant was on the wrong side for the British, the original compass, the electrical junction box and the fluorescent lighting installations in the instrument panel were in contention. The armor plate and the markings used in electrical, hydraulic and other systems were also items of heated discussion, since they were not to British standards. The changes resulting from the board reviews had a relative impact on the aircraft design and performance. What started out proposed as a sleek 400 mile an hour airplane now had some of its attributes shaved to accommodate the changes affecting weight, balance and aerodynamics.

Other changes would come about as the result of flight testing of the prototype airplane. The changes were then assigned to be implemented at specific points in the manufacturing process in order to maintain a most efficient production flow. However, there were changes that the customer sought to impose as afterthoughts in order to improve the systems and the operational envelope of the aircraft. Such was the case with a request to extend the specified operational range of the Mustang before the delivery of the first airplane.

A letter from L.C. Costello, the Resident Technical Officer for the British Air Commission was received on January 7, 1941. The letter, sent in behalf of Air Commodore G.B.A. Baker, required information on the maximum possible range of the NA-73 Mustang, at several speeds, maximum possible takeoff weight and with all other than navigational and armament equipment removed. This request arrived at a critical time, as the first production aircraft of Contract A-250, for the British Mustang, was nearing completion and would soon begin flight tests. The post-crash rebuild of the NA-73X prototype was approaching completion and it would be returned to flight test status on January 13. Tests on the XX73 static test ship which would reveal flaws in structural design of the airplane were also under way.

Edgar Schmued of the Preliminary Design Department and Ed Horkey of the Aerodynamics Department were no strangers to the formulation required to achieve the configuration needed to meet the British Air Commission's request. They had both been involved in the request for comments from the Material Command in response to CP39-770, a fighter competition, in early 1939, where the fuel load required by the provided specification dictated an airplane too large to be considered maneuverable enough to carry out its proposed mission. Ed Schmued suggested that external droppable tanks be used to carry the fuel overload, a practice that was contrary to Army Air Corps policy due to danger of fire in crash landings. At the time of this study, NAA was not asked to compete, as it had been relegated to the production of medium bombers, trainers and observation planes by the Army Air Corps.

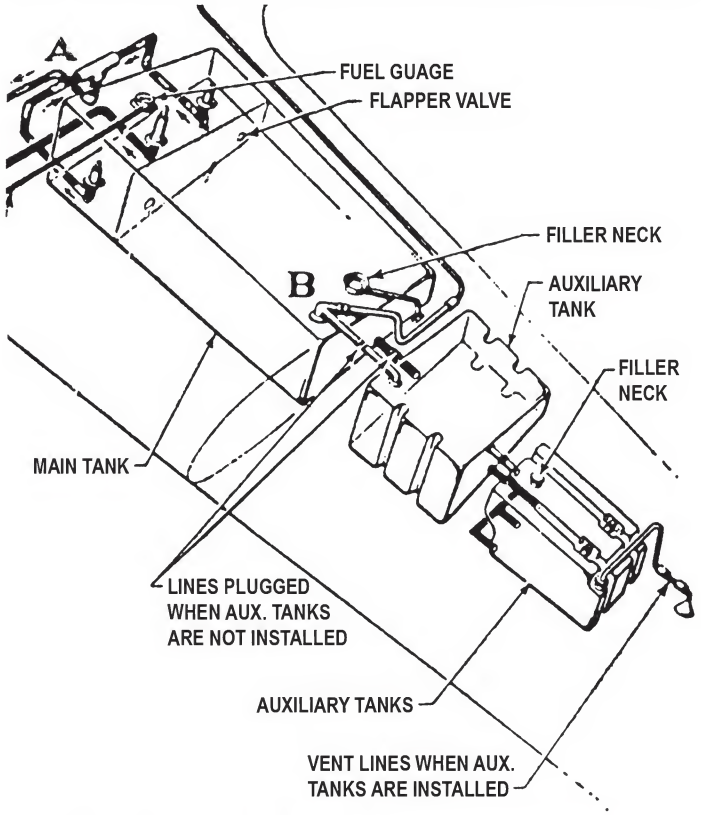
In the usual course of business, a meeting was convened, which included the heads of the key departments involved, in the War Room of the Administration Building, to determine the feasibility and possible solution to the British request. Considering the sketchy requirements sent by the British Purchasing Commission and the work load on hand, NAA responded with a request to Mr. Costello for clarification. The minimum armament and communications that the customer considered sufficient, the range required and the limitations on takeoff run with the fuel overload in question were the key elements. NAA's request was forwarded to the British Purchasing Commission on January 20 with a reply being returned on January 24, which indicated that all armor and armament were to remain in place, the radio weight could be reduced, the range was to be at least 1,500 miles, allowances in drag were to be made for external fuel tanks and no existing runway extension required.

On receiving this data, Ed Horkey of Aerodynamics prepared a letter report to Chief Engineer Raymond Rice. Horkey calculated that the amount of fuel needed to meet the range requirement was 197.24 gallons at 229 mph at 10,000 ft, with 53.86 gallons of fuel being carried in the gun and ammunition bays in the wings instead of using external tanks. The total fuel capacity would be 221 gallons, more than enough to meet the range requirements. This would leave the two .50 caliber fuselage machine guns for combat and require the wing guns to be stowed in the fuselage with no ammunition for ferry purposes, or removed from the plane entirely for a tactical mission. A subsequent investigation by John Young, of the Power Plant Department, showed that a total of 60 gallons of fuel could be carried in the gun and ammo bays.

On February 20, Raymond Rice delivered a letter report to L.C. Costello, which outlined NAA findings with respect to the B.P.C. requirements and requested comments on this proposal at the earliest possible date. The figures reported showed the total fuel required for the 1,500 mile required range would be 200 U. S. gallons, with consideration for engine warm-up, takeoff and climb to 10,000 ft at 75% rated power. The estimated weight of the airplane at takeoff would be 8,400 pounds and the takeoff distance was calculated at 1,600 feet to clear a fifty-foot obstacle.

Meanwhile, NAA prepared plaster molds of the gun and ammunition bays which were sent to the Firestone Tire and Rubber Company along with a description of the intended application. Firestone followed through with experiments on the construction of the cells and conducted a test with 100 octane fuel to determine if a reaction would be experienced with the cell material that would lead to contamination. This test ran for 216 hours, with no erosion or contamination being found.

John Young issued a memorandum report on the auxiliary fuel system on April 14, 1941 describing the system as consisting of three small cells for the ammunition compartments and one large cell for the gun compartment, or eight cells per airplane. He further calculated the actual fuel capacity of the added installation at thirty-five gallons per side minimum, or seventy gallons additional fuel per plane, actual capacity. The tanks, were made of 3/16-inch thick rubber and were expected to withstand exposure to fuel for a minimum of ten days. The tanks were to be interconnected through rubber tubing plumbed on the underside of the wing and protected by a metal fairing.



AUXILIARY TANK INSTL – LH (RH OPPOSITE)

Illustration from the Lowell Ford Collection

Layout of fuel cells fitted and located in the Mustang I wings.

The gun compartment cell was to be connected directly to the main tank with gravity feed. The cost of the installation per ship was expected to be $125.00. This report put the maximum range of the Mustang airplane with the auxiliary fuel cell installation at 1,724 miles.

In the first week of June 1941, NAA received a formal request for a quote on the extended range fuel cell installation which had been developed for the Mustang. In the same instance, the request insisted that this modification "occasion no delay in the delivery of any of the airplanes". This last statement posed a real challenge for NAA, since the results of the structural tests on the XX73 airframe had revealed changes required to strengthen the structure of the wing and fuselage to meet the requirements of a tactical aircraft. This combined with the changes brought about from the post crash analysis of the X73 (NA-73X) prototype had slowed production to allow for modifications in tooling and airframe elements.

The Extended Range Modification was to be provided as a Government Furnished Equipment item and in order to present the modification to the proper authorities, drawings, specifications and test results had to be compiled into a formal package for review. On June 11, 1941, Raymond Rice informed the British R.T.O. that these formal documents were not finalized at this time as the fuel cells were still under development.

Firestone Rubber Company had continued development work on the fuel cells in support of a potential new product and provided NAA with a requested update on their progress in a report dated June 11, 1941. By adjusting the thickness of the top, bottom and sides of the fuel cell design and compensating for irregularities in the wing compartments, they were able to provide capacity for 70.25 gallons, with a potential of 76.25 gallons per set of cells. The cells were retested to 216 hours of slosh test with 100 octane fuel and there was no change in the less than five milligrams of residue per 100 cc of gasoline. The cells also withstood 25.5 hours of oscillations without any sign of leaks.

Coincidental with Firestone's report to NAA, the British R.T.O., L.C. Costello, approached Firestone independently for technical data related to the fuel cells under development for the Mustang. He was courteously informed that that the fuel cell development project was an effort entered into between NAA and Firestone and that NAA controlled the documentation, test results and rights to the project. Mr. Costello would have to go directly to NAA for any information he requested in this respect.

Subsequent conversations between Raymond Rice and R.T.O. Costello regarding the potential delays in production by introducing the fuel cell modification to the Mustang production line brought about an explanatory letter on June 18 to Mr. Roy E. Russell of the British Purchasing Commission. In it, Rice explained that since, as brought out by the R.T.O., the B.A.C. was not prepared to supply the necessary fuel tanks, NAA had been requested to provide a quote for the installation complying with this requirement. Rice addressed the production impact and stated that the modifications could be installed beginning with production ship number 143 to number 320 of Contract A-250 and on all the 300 ships of Contract A-1495, inclusively, at a cost of $245.35 per airplane. He reiterated the integrity derived from the testing of the cells and that the 1,500 mile range could be met.



Photo from the Lowell Ford Collection

The North American NA-73X made its maiden flight in October 1940.

The British Air Commission responded through the R.T.O. with a new request calling for NAA to make the installations necessary as stated to accept the Extended Range Modification. However, before all was said and done, a decision was reached that placed all the plumbing and fittings necessary to support the installation inside the wing. The tanks would be supplied as a kit to be included in the crate with each delivered aircraft as described in Rice's letter of June 18. The economics of the final agreement were handled under the "Lend-Lease" program and the project moved forward causing minimal impact on the production assembly line.

Though the Extended Range Modification was discussed in terms of use as an improvement aimed at ferrying the Mustang over long distances, how or if the British employed the system remains without substantiation. One rumor that was encountered indicated the installation was used in order to do photo-recon work on a German heavy water plant in Norway.

Had it not been for altitude limitations, the Mustang could have appeared over Berlin as an escort fighter much earlier than history has shown it and perhaps the war could have been significantly shortened. To give one an idea of the potential application of a Mustang I equipped with this modification, depending on the departure point from England, round trip missions could be flown into Norway, Denmark, the Western two-thirds of Germany and the Northern three-fourths of France. In a one-way flight, the distance covered by a Mustang I with the Extended Range Modification and a full fuel load could reach the outskirts of Moscow.

Subsequent alterations to increase the range of the Mustang would include the addition of underwing drop tanks and eventually the addition of an 85 gallon fuel tank in the fuselage which, with underwing drop tanks and the Merlin engine, enabled the Mustang to do escort service with bombers to Berlin and back. This increased performance and a USAAC policy change from "Protect and Defend" to one of "Seek and Destroy" served to severely cripple the Luftwaffe's efforts to defend its homeland.

About the Author: Lowell hails from Ocean Springs, MS, just a few miles east of Keesler AFB which accounted for many AT-6 and B-25 flights over his home. He developed an early interest in aviation and began flying forward swept wing gliders in 1949 while still in high school. He moved to California in 1962 and joined NAA/LAD as a Blueprint Folder and Trimmer. Except for a four-year stint in the military he continued working until he retired from Boeing North American in 2003. He currently resides in Torrance, CA with his charming wife, Linda.

Trisonic Wind Tunnel's Last Gasp

by Andrea Woodhouse, Staff Writer

Reprinted from the September 10, 2007 ***Torrance Daily Breeze***

For the first time in a long while, the air was still inside the North American Trisonic Wind Tunnel. Not a single breeze passed through the 500-foot long tunnel, which is capable of generating wind speeds faster than three times the speed of sound.

And the air was thick and heavy Friday – possibly from the stubborn late-summer heat, or maybe from the sadness as the few lingering employees at the landmark El Segundo facility prepare to close up shop this month for good.

"It's very sad for everyone involved in this tunnel," said Rick Hayes, the facility's director of operations. "It's just so unique. We love to show it off, but it is in very sad shape right now."

Using the same technology and equipment as it did in its first run 50 years ago, the tunnel performed its 807th – and final test August 29th, Hughes said.

The past two weeks have been filled with writing final reports, last-minute archiving and impromptu visits from old employees nostalgic for one last look at a facility that through the years tested high-profile projects like the Apollo space program and XB-70 supersonic airplane.

"This was the first generation of big, supersonic wind tunnels," Hughes said.

The tunnel's landlord, UCLA, has opted to close the facility, mostly citing environmental concerns over previous PCB spills, said Brad Erickson, UCLA's director of campus service enterprises.

Original owner Rockwell International, formerly North American Aviation, donated the property to UCLA in 1998 for use as a university research facility, which never really materialized, Erickson said.

Since then, Triumph Aerospace Systems has continued to operate the plant, paying rent and sharing profits with UCLA, Hughes said.

With a 49-square-foot test section allowing for larger test models and letting engineers actually stand up, the Trisonic is unusually large, considering most tunnels have a 16-square-foot test area, Hughes said.

"Boeing, Douglas and Lockheed all built smallish tunnels, and North American built a tunnel nearly twice as big," he said. "It remains to this day unique in size and performance."

But the tunnel's real claim to fame is it's ability to perform tests at up to 3-1/2 times the speed of sound, making nearby Northrop Grumman's tunnel that hits about 100 mph look like an oscillating fan.

Sans wind, the slick tunnel would make a dream playground for children or an awesome skateboarding venue.

On the tunnel's northern end, its smooth walls lead through a pitch-black corridor, ending at a 28-foot tall screen, from which the forceful gusts pass and voices cast echoes.

The other side of the tunnel leads to a cement hall and giant, curved grate that catches any flying objects and lets air pass through a vent.

Circular holes cut into the "colander" as Triumph employees call it, filter light through and provide an excellent grip for little hands, making for a fine jungle gym.

The tunnel routinely blows about 1,300 hours a year, and in January alone clocked 300 hours, Hughes said. Tests cost $3,500 an hour, he said.

And though the tunnel has been all business for the past 50 years – testing planes, rockets and bombs for aerospace giants, as well as the government and private companies like Cessna – Triumph's remaining half-dozen have invited Trisonic veterans for a nostalgic-fest Saturday.

A crew will spiff up the tunnel this week, making it clean and safe for former employees, vendors and old friends to walk the spans one last time, Hughes said.

In tears off and on for the last few days, the Playa del Rey resident sent an emotional invitation to old friends: *"Those of us who worked here in the final generation of staff and crew feel that it has been the job of a lifetime – an honor and a privilege to have been part of the Trisonic Wind Tunnel Story,"* Hughes wrote.

The Trisonic is the latest casualty in what industry insiders have called a "wind-tunnel crisis", as high capability are frequently scrapped, forcing rocket and plane manufacturers to go overseas for testing.

About five years ago, Lockheed Martin dismantled its tunnel near Santa Clarita and sent it to Asia. NASA has shut down several tunnels, and Douglas Aircraft shuttered its facility in El Segundo in the mid-1980s, Hughes said.

"Some of our customers are extremely upset," he said. "They can get the same capability if they go to Europe or Russia. But they do not want to do that, especially if they have secure projects."

A trend of outsourcing testing has contributed to the tunnels' disappearance, exacerbated by the explosion of computer technology, Hughes said. "Computer prediction is sexy," he said. "Simulation is not sexy."

But the accuracy from a wind tunnel cannot be beat, said long time employee Gary Wilhelm. "Computers have not come close to this," he said, adding that his 34 years working at the tunnel have been "more than fun."

UCLA has still not decided what to do with the land, Erickson said Friday. Environmental remediation is a must, but the university has been approached by the federal government for a possible sale and is open to salvaging materials, he said.

As the South Bay says goodbye to the antique facility, a remaining nod to the area's aerospace heyday of the 1950s, Triumph employees are busy looking for new jobs. But Hughes, a native of England, said Friday he didn't have final plans yet, as he toured the facility with the look of a proud father in his deep blue eyes.

"It's just such neat stuff," he said.

Editor's Note: We are grateful to Mr. Phillip Stanfield of the Torrance Daily Breeze for permission to reprint this article in its entirety.

Space Shuttle Mission STS-120 Completed Successfully

by Ed Rusinek

With Shuttle Mission STS-120, Orbiter *Discovery* completed the 23rd shuttle mission to the International Space Station. Commanded by retired USAF Col. Pamela A. Melroy, the orbiter delivered the the Italian-built U.S. multi-port Node 2 module, named *Harmony*. The module will provide attachment points for European and Japanese laboratory modules. Marine Corps Col. George D. Zamka served as the pilot. The mission specialists were Scott E. Parazynski, Army Col. Douglas H. Wheelock, Stephanie D. Wilson, and European Space Agency astronaut from Italy Paolo A. Nespoli, and Expedition flight engineer Daniel L. Tani. Zamka, Wheelock and Nespoli were making their first spaceflight.

Discovery docked with the International Space Station and its Expedition 16 crew of Commander Peggy A. Whitson, and Flight Engineers Yuri Malenchenko and Clayton Anderson.

Commanders Melroy and Whitson became the first female spacecraft commanders to concurrently lead Space Shuttle and Space Station missions—a historic, yet unplanned event.

Discovery's crew also performed four spacewalks which involved relocating the Port 6 or P6 truss and solar arrays to their permanent positions on the Space Station. During the second spacewalk, a problem was discovered with one of the Solar Array Rotary Joints (SARJ) where metal shavings were found under the SARJ housing.

A critical situation on the third spacewalk developed when a guy wire got entangled with a solar array being unfurled, causing almost a three-foot hole in one solar panel and a slight rip in another. The damage would have a severe impact on the station power system.

Teams of engineers and astronauts went to work to develop a plan to repair the damaged panels. Emergency room doctor/astronaut Scott Parazynski was selected to perform this feat of daring on the fourth spacewalk.

NASA downplayed the danger of Parazynski being shocked or electrocuted but the risks were very real. Although damaged, the array still produced 97% of its power output capacity and as long as the array was deployed—even partially—there was no cutoff switch!

Equipped with a pair of needle nose pliers, wire cutters and a Kapton tape-covered "hockey stick" fashioned out of Teflon, Parazynski began his improvisation. In a moment of rare audacity, and 215 miles above the Earth, he had to use Douglas Wheelock's backpack as a stepping stool to boost himself onto a boom controlled by the 58-foot robotic arm which was operated from inside the station by Daniel Tani and Stephanie Wilson.

During the 45-minute ride from the air lock to the damaged array, Paolo Nespoli read to the dangling astronaut from the NASA mission instructions manual of the dangers implied.

The first sign of trouble became evident upon arrival at the damaged solar array. At 6'-2", Scott Parazynski is one of the tallest astronauts but his reach fell several inches short. All work would have to be accomplished with his hands fully stretched above him.

Using the hockey stick deftly, he pulled the soft blanket-like array towards him to darn the tear together using wire harnesses NASA calls "cufflinks". At times the harness ends would not fit into the holes. With gloved hands, he would try to force the ends through, pushing them close to the orange panels which he could not touch for fear of risking a shock.



NASA Photo

Expedition 16 and STS-120 crewmembers pose inside the* Harmony *module. Top row: Daniel Tani, Scott Parazynski, and Douglas Wheelock. Middle row: Stephanie Wilson, Commander Pamela Melroy, and Paulo Nespoli. Bottom row: ISS crewmembers Clayton Anderson, Commander Peggy Whitson, and Yuri Malenchenko, and STS-120 Pilot George Zamka.

The hoped-for 30-minute timeline to repair the array was dashed when Parazynski found a "hairball" of frayed wires, ripped grommets and broken hinges. He also located a snarled wire which held up the unfurling of the array. On the count of three, he cut the wire and watched the array unfurl to its full 110-foot glory. Parazynski and Wheelock were ferried back to the air lock. Total time outside the station was 7 hours, 19 minutes.

Discovery undocked from the Space Station and Pilot George Zamka performed a fly-around maneuver to inspect the Space Station. After detailed inspections to the Shuttle's thermal tile system, *Discovery* reentered Earth's atmosphere and returned to Kennedy Space Center on November 7, 2007 after 15 days, 2 hours and 23 minutes in space—one of the longest duration, and most challenging and dangerous Space Shuttle missions ever accomplished.

Fourth B-1 Reunion

The Fourth B-1 Reunion was held on September 22, 2007 at the Golden Sails Hotel in Long Beach with more than 200 in attendance. It was a splendid mix of current employees working on the program and retirees from California, Nevada, Arizona, Oregon, Washington, Utah, Idaho, Missouri, Ohio, and Florida.

The speaker, Captain Scott "Disco" Higginbotham began flying the B-1 in 2000. He has four combat deployments, 58 combat sorties, 3 missions during Operation Anaconda, the 2005 General Curtis E. LeMay Combat Crew Award and many other awards and accomplishments. He is currently assigned to a test and evaluation squadron at Edwards AFB. He is the only B-1 Pilot whose father also flew the B-1. He kept the audience captivated with his presentation and received a rousing response of appreciation at the conclusion of his talk.

It was another great effort by Lynn Isomoto, Karen Fraser and Lee French.

The Battle of Palmdale

as recalled by Dr. Raymond Puffer, Historian

On the morning of 16 August 1956, Navy personnel at Point Mugu prepared an F6F-5K Hellcat for its final mission. The aircraft had been painted overall high-visibility red. Red and yellow camera pods were mounted on the wingtips. Radio remote control systems were checked, and the Hellcat took off at 11:34 a.m., climbing out over the Pacific Ocean. As ground controllers attempted to maneuver the drone toward the target area, it became apparent that it was not responding to radio commands. They had a runaway.

Ahead of the unguided drone lay thousands of square miles of ocean into which it could crash. Instead, the old Hellcat made a graceful climbing turn to the southeast, toward the city of Los Angeles. With the threat of a runaway aircraft approaching a major metropolitan area, the Navy called for help.

Five miles north of NAS Point Mugu, two F-89D Scorpion twin-jet interceptors of the 437th Fighter Interceptor Squadron were scrambled from Oxnard Air Force Base. The crews were ordered to shoot down the rogue drone before it could cause any harm. Armed with wingtip-mounted rocket pods and no cannon, the Scorpion was typical of the Cold War approach to countering the "Red Menace." Each pod contained 52 Mighty Mouse 2.75-inch rockets. Salvo-launched, the Mighty Mouse did not have to have precision guidance. Large numbers of rockets would be fired into approaching Soviet bomber formations to overwhelm them with sheer numbers. Today, they would be used against a different kind of red menace.

At Oxnard AFB, 1Lt. Hans Einstein and his radar observer, 1Lt. C. D. Murray, leapt into their sleek F-89D. Simultaneously, 1Lt. Richard Hurliman and 1Lt. Walter Hale climbed into a second aircraft. The interceptors roared south after their target. The hunt was on.

Einstein and Hurliman caught up with the Hellcat at 30,000 feet, northeast of Los Angeles. It turned southwest, crossing over the city, then headed northwest. As the Hellcat circled lazily over Santa Paula, the interceptor crews waited impatiently. As soon as it passed over an unpopulated area, they would fire their rockets.

The interceptor crews discussed their options. There were two methods of attack using the fire control system, from a wings level attitude or while in a turn. Since the drone was almost continuously turning, they selected the second mode of attack. In repeated attempts, the rockets failed to fire during these maneuvers. This was later traced to a design fault.

The drone turned northeast, passing Fillmore and Frazier Park. It appeared to be heading toward the sparsely populated western end of the Antelope Valley. Suddenly, it turned southeast toward Los Angeles again. Time seemed to be running out. Einstein and Hurliman decided to abandon the automatic modes, and fire manually. Although the aircraft had been delivered with gun sights, they had been removed a month earlier. After all, why would a pilot need a gun sight to fire unguided rockets with an automatic fire control system?

The interceptors made their first attack run as the Hellcat crossed the mountains near Castaic. Murray and Hale set their intervalometers to "ripple fire" the rockets in three salvos. The first crew lined up their target and fired, missing their target completely. The second interceptor unleashed a salvo that passed just below the drone. Rockets blazed through the sky and then plunged earthward to spark brush fires seven miles north of Castaic. They decimated 150 acres above the old Ridge Route near Bouquet Canyon.

A second salvo from the two jets also missed the drone, raining rockets near the town of Newhall. One bounced across the ground, leaving a string of fires in its wake between the Oak of the Golden Dream Park and the Placerita Canyon oilfield. The fires ignited several oil sumps and burned 100 acres of brush. For a while the blazes raged out of control, threatening the nearby Bermite Powder Company explosives plant. The rockets also ignited a fire in the vicinity of Soledad Canyon, west of Mt. Gleason, burning over 350 acres of heavy brush.

Meanwhile, the errant drone meandered north toward Palmdale. The Scorpion crews readjusted their intervalometers and each fired a final salvo, expending their remaining rockets. Again, the obsolete, unpiloted, unguided, unarmed, propeller-driven drone evaded the state-of-the-art jet interceptors. In all, the jet crews fired 208 rockets without scoring a single hit.

The afternoon calm was shattered as Mighty Mouse rockets fell on downtown Palmdale. Edna Carlson was at home with her six-year-old son William when a chunk of shrapnel burst through her front window, bounced off the ceiling, pierced a wall, and finally came to rest in a pantry cupboard. Another fragment passed through J.R. Hingle's garage and home, nearly hitting Mrs. Lilly Willingham as she sat on the couch. A Leona Valley teenager, Larry Kempton, was driving west on Palmdale Boulevard with his mother in the passenger seat when a rocket exploded on the street in front of him. Fragments blew out his left front tire, and put numerous holes in the radiator, hood, windshield, and even the firewall. Miraculously, no one was injured by any of the falling rockets. Explosive Ordnance Disposal teams later recovered 13 duds in the vicinity of Palmdale. It took 500 firefighters two days to bring the brushfires under control.

Oblivious to the destruction in its wake, the drone passed over the town. Its engine sputtered and died as the fuel supply dwindled. The red Hellcat descended in a loose spiral toward an unpopulated patch of desert eight miles east of Palmdale Airport. Just before impact, the drone sliced through a set of three Southern California Edison power lines along an unpaved section of Avenue P. The camera pod on the airplane's right wingtip dug into the sand and the Hellcat cartwheeled and disintegrated. There was no fire.

There are four things that you cannot recover:

The stone… after the throw!

The word… after it is said!

The occasion… after it has passed!

The time… after it is gone!

Contrails From The Past

by Ed Rusinek

Dear Ed,

I thank you and your bulletin staff for the fine job you do. I am 93 years old and I plan to read the retirees bulletin for several more years.

—Victor McLaughlin, Santa Maria, CA

Ed's Ans.: Well, God Bless you, Victor. We always love to hear from our readers that are 93 years young!

Dear Ed,

In the *"Eddie and the Elephant"* article, Fall 2007 Issue, it mentioned that NAA opened a second factory in Grand Rapids, Texas. I believe it should have read Grand Prairie, Texas.

—Roger Song, Vancouver, WA

Ed's Ans.: Roger, you are absolutely right. Texas is BIG but it doesn't stretch all the way to Michigan. Good catch!

Dear Ed,

I look forward to receiving the NAA Retirees Bulletin but I am particularly enjoying the wonderful articles on the X-15 program. They bring back truly fond memories. I was a secretary for Jim Doell, an X-15 Program Engineering manager, from 1965 until the program ended in 1969, and found the program exciting. Clearly, it WAS exciting. Those were wonderful years and I had the privilege of working with some unique and bright people.

—Ann DeBriere, Fallbrook, CA

Ed's Ans.: Thank you, Ann, for those kind words. You know, looking back, every program seemed more EXCITING than the last one! The bulletin only reflects the quality of the people and products that were part of North American Aviation and they were the best!

Dear Ed,

I pass along all issues to my oldest daughter and her family. You are enabling people to know about the great things that happened (and are still happening).

My husband, Ken, really enjoyed working for North American/Rockwell at Autonetics.

—Martha West, Long Beach, CA

Ed's Ans.: Thank you for your kind words. Our publications are now being archived at several aviation history offices because they provide insights into the industry that cannot be found anywhere else.

Dear Ed,

Enclosed is my check for a two-year renewal subscription to the bulletin. I did not use the form in the bulletin as it would have ruined the wonderful picture of the Navaho launch. I happened to witness the last Navaho launched at the Cape as I had just moved there with my husband who worked for Convair at the time. Incidentally, if memory serves me right, the Navaho blew up. It was really very sad.

I want to congratulate all of you for the marvelous work you are doing. The Bulletin is one of the few links I have left of some of the good days of my past. If I lived closer, I would volunteer to help in some way, but Seal Beach would be one heck of a commute for me.

—Beatrice McCoy, Boise, ID

Ed's Ans.: Thank you, Beatrice, for your kind offer to volunteer. However, we no longer have an office in Seal Beach. Boeing only provides us a mailbox and an incoming phone line to record messages. The entire task is performed individually from our homes with the printing and addressing done by commercial vendors. We have survived these past seven years almost entirely thanks to the wonderful support provided by readers like you. God Bless!

Dear Ed,

I am enclosing a check to renew my subscription and to send a gift subscription. I didn't use the renewal form because I didn't want to cut out the P-51 picture on the cover. As a teenager, I installed the bullet-proof windshields and the canopies for the P-51B, then the P-51D, during World War II.

I retired from Autonetics in 1987 after 30 years of service.

—Lila Lev, Lakewood, CA

Ed's Ans.: When we think of North American Aviation, we usually think of the men that made the company great. But, in the final analysis, there were a lot of ladies like you, Lila, that provided that extra touch of quality that made our products the best in the world. God Bless!

Dear Ed,

Enjoyed the *"California Boomerang"* story about John Conroy and his impressive 1955 dawn-to-dusk flight. Actually, a VR-31 pilot named LCDR George Whisler, USN was the first to make this historic round trip flight in 1954. We were friends and shipmates in a Navy ferry squadron based at NAS, Norfolk, VA. We flew almost all of the Navy aircraft then operating, new and old, from factory to grave. Most of us were young Junior Officers, fresh from Fleet squadrons or flight school and several of us tried to make this flight for fun! At least two of us almost made it in 1952 flying new Grumman F9Fs from Norfolk to San Diego and new Douglas F3D twin engine jets back home.

I met John Conroy years later when we were civilian test pilots at an LA SETP meeting. He gave me some great advice-never try for a record without a PR guy on your team. When George Whisler read about John's 1955 record flight, he went to work and had his own 1954 flight officially recognized. This led to a correction of the National Aviation Records which can now be easily verified.

—Rick Cotton, Punta Gorda, FL

Ed's Ans.: On June 23, 1953, Whisler flew west in an F9F-6 Cougar (BuNo 127432) and returned east in an F3D-2 Skynight (BuNo 127076). Conroy did it in the same F-86A, (Aircraft S/N 49-4049) going east and coming back west. It still makes for a good story!

The Silent Majority

by Stan Guzy

ADAMS, JOHN T., 91 – passed away peacefully at home in Hermosa Beach, CA on October 14, 2007. He retired in 1979 from LAD after 41 years of service as a military contract negotiator. His loving wife, Maxine, survives him. When John turned 90, he was asked for wisdom. He replied, "To love and to be loved."

ARPEA, ERNEST D., 85 – of Torrance, CA, passed away on June 3, 2007 from complications of heart failure. Ernie served as an engineer in the metals analysis group of Quality Control at LAD before he retired in 1990 with 35 years of service. His loving wife Sachiko survives him.

BALDUCCI, JOHN, 74 – died of liver cancer on September 13, 2007 with his family at his bedside. John was employed at the Autonetics Division for 29 years. His beloved wife Marie preceded him in death.

BRASKAMP, LEON, 78 – of Placentia, CA passed away on September 7, 2007. Leon joined NAA in Downey and retired from Autonetics in 1984 with 36 years of service.

BROWN, DALE L., 92 – passed away quietly at home in Rossmoor, CA on September 21, 2007. Dale accepted a position on the Technical Staff with the Aerophysics Laboratory of NAA, which later became the Autonetics Division. Dale worked on experimental radar, weapons systems and systems integration on the Apollo Program before retiring in 1975.

BROWN, VERA T. "GIGI", 92 – died on September 22, 2007 in Rosamond, CA. Vera was the first woman to be hired by NAA at Plant 42 in Palmdale in 1951. She was secretary to Richard Stacey in Engineering Flight Test Operations at Palmdale and at EAFB. Vera retired after 27 years of service. She was a president of the National Secretary Association and an active member of the Rockwell Retiree Golf Club.

CHESTER, LEONARD, 93 – passed away on June 2, 2007 at Cherrywood Village Retirement Center in Portland OR from complications attributed to aspirational pneumonia. He joined NAA in 1940 and worked in manufacturing engineering, and engineering management when the P-51 Mustang was in production. He worked on many NAA/RI programs and also worked in Tulsa on the Boeing 747 aircraft before retiring in 1974. His loving wife Virginia preceded him in death.

DAO, LAP, 62 – a resident of Tustin, CA passed away suddenly on September 13, 2007. Before retiring Lap had worked at NAA/RI for many years in the Logistics Engineering area. His wife Lyn Ngo survives him.

DONATONI, LINO, 91 – died on August 3, 2007 from undisclosed causes. Lino had served as Manager for Transportation and Traffic at NAA/RI in El Segundo prior to retiring after 47 years of service. He leaves behind his loving wife of 21 years, Elsie Wagner.

DOWNIE, WILFRED J., 97 – passed away in late 2006 in Vancouver, BC. He started at LAD in communications, navigation and avionics engineering in the 1940s and transferred to Autonetics in the 1960s where he worked in avionics engineering until he retired in the 1970s.

GARCIA, GILBERT "GILBY", 73 – died in Long Beach, CA on October 9, 2007. He retired from Rockwell in 1990 after 27 years of service. In his free time, Gilbert taught ballroom dancing and golf. His loving wife Yolanda survives him.

GASPER, RICHARD "PARKER", SR., 80 – of Long Beach, CA, passed away on October 19, 2007 of complications related to diabetes. Parker served at Autonetics for 30 years before retiring.

GIBB, JOHN W., 88 – died at his home in Claremont, CA on November 8, 2007. John joined NAA at LAD in 1949 where he rose to management of the X-15 propulsion systems design. He transferred to the Space Division in 1961 to head up the Apollo Reaction Control System design and later, the management of the Space Shuttle Orbiter Environmental Control and Life Support Systems. He was highly respected, both as a man and as an engineer.

HELSEL, RONALD W., 82 – passed away on August 17, 2007 from undisclosed causes. With a UCLA engineering degree Ron went on to have a long and distinguished career at the Rocketdyne Division of NAA/RI before retiring after 40 years of service. Colleen, his wife of 61 years, survives him.

HONSLER, RICHARD "DICK", 73 – passed away in Reno, NV on March 8, 2007. Dick worked in LAD Tooling. He retired in 1987 after 25 years of service. His loving wife Mary survives him.

H**OSE, ROBERT L. "BOB", 79** – of Torrance, CA, died on July 15, 2007 of heart failure. Bob retired as a shop supervisor from the LAD Tooling Department in 1987 after 41 years of service. His loving wife Sivan survives him.

KELLER, GERHARD R., 76 – of Rancho Palos Verdes, CA, died on July 27, 2007. A graduate of Ohio State University, Gerhard joined NAA at El Segundo in 1956 and served there for 30 years. His wife Kathy survives him.

LARSON, W. HAL, 90 – of Pasadena, CA, Bulletin returned stamped "Deceased". Hal died as a result of a fall. He served as an electrical engineer at LAD and Space Division for over 20 years before retiring in 1972. His wife Miriam survives him.

LONG, JAMES, 87 – passed away in Lawndale, CA on September 11, 2007. Jim rose above the harshness of a childhood raised in an orphanage during the Depression and obtained a scholarship to the Colorado State College of Mines in Greeley, CO. He joined NAA in 1940 as an inspector and worked his way up to management in charge of Product Inspection Quality Control on the Apollo program at Downey. He retired in 1980 after 40 years of service.

MAIER, WESLEY H., 91 – died on August 30, 2007 in Temecula, CA. Wes worked in the Long Beach shipyards during World War II. He joined NAA at LAD as an electrical design specialist, eventually transferring to Rocketdyne where he worked on the electrical circuitry for the Mercury rocket engines. His wife Hilda survives him.

MARTIN, ENID P., 86 – passed away peacefully on August 13, 2007 from undisclosed causes. Enid had been Executive Secretary to the President of NAA/RI Autonetics Division, retiring in 1983 after 33 years of service. Norman, her devoted husband preceded her in death.

MITCHELL, EDWARD E., "ED", 82 – died in Long Beach, CA on October 8, 2007. Ed retired from Assembly Tooling at LAD in January 1988 after 41 years of service. Ed's health had been failing having had three bypass surgeries. His wife Ellan survives him.

MOODY, SAMUEL P., 76 – died of a brain tumor on November 1, 2007 at home in Desert Hot Springs, CA. Sam joined NAA at KSC in 1958 as part of the Apollo ECS Test and Checkout team. In 1971, he transferred to Space Division to work on the Space Shuttle Orbiter Environmental Control and Life Support systems. In 1981 he went to Vandenberg AFB to help prepare a Shuttle Launch Facility and in 1986 he returned to Downey to work on the Strategic Defense Initiative (Star Wars Program). He retired in 1992 after 36 years of service. He is survived by his wife Marie.

OKUDA, JACK H., 76 – of Los Angeles, CA, died on May 7, 2007 of lung cancer. He joined NAA at LAD and retired from Space Systems Division in Downey as the project lead and manager of the Rockwell Technical Information System (RTIS), the library database system, in 1993. His loving wife Sakae survives him.

OLIVARES, WILLIAM R., 91 – passed away on September 22, 2007 at home in San Juan Capistrano, CA of prostate cancer. Bill started at NAA at LAD in 1937. He retired as supervisor in the Sheet Metal Department in Downey in 1977 after 40 years of service.

PARKER, JACK D., 66 – passed away in Beverly Hills, CA on June 18, 2006 from complications of a kidney failure. Jack retired in 1985 after 30 years of service. He was a machinist in the "Jig Bore Room" in Tooling Building 101. His loving wife Sue survives him.

PORRECA, WILLIAM R., 72 – passed away on September 1, 2007 from undisclosed causes. He had worked for NAA/RI for many years before retiring. Josephine, his wife of 46 years, survives him.

PROVOST, RALPH C., 80 – passed away peacefully on September 16, 2007 after battling lung and bone cancer for the past year. He was a long time resident of Tustin, CA and worked in Engineering and as a Contracts Specialist for NAA/RI for 35 years before retiring in 1986. He is survived by his wife of 53 years, Connie.

RITCH, HERALD L., 87 – of Hawthorne, CA, passed away on October 5, 2007 of natural causes. Herald enlisted in the Army before Pearl Harbor and served as a drill sergeant at Fort Ord, CA. After being discharged, he joined North American Aviation.

SAINDON, DONALD, 77 – Don passed away on September 13, 2007 from undisclosed causes. He had been a resident of Long Beach, CA for 45 years. He retired from NAA/RI as Assistant Division Director of Material after 29 years of service, which included serving as the Lead Negotiator for NAA/RI in the purchase of the Boeing 747, which was used to ferry the Shuttle Orbiter from Edwards AFB to the launch facility in Florida. His wife, Rose Marie, preceded him in death.

SENTER, JOHN F., JR., 85 – a resident of Northridge, CA passed away on September 10, 2007 from undisclosed causes. A mechanical engineering education enabled John to have a successful career in the aerospace industry. He retired from NAA/RI several years ago. John had also been an ordained minister and is survived by Nancy, his wife of 54 years.

SHERMAN, JOHN R. "JACK", 77 – passed away in Rocklin, CA on October 31, 2007. Jack worked in Contracts and Purchasing at LAD and Rocketdyne before retiring in 1990 with 25 years of service. He is survived by his wife Joyce.

SMITH, WALTER D., 81 – a long time resident of Lomita, CA, Walter died on October 2, 2007. After service in the Army, Walter retired from North American Rockwell after more than 40 years of service. He was a lifelong Corvette lover and motorcycle enthusiast. His wife Maria survives him.

SNELGROVE, TOD, 88 – passed away in Torrance, CA on August 17, 2007 after a brief illness. He joined LAD in 1937 and served for 35 years before retiring from Space Division in 1979.

STONE, G. L. "GERRY" – of Grass Valley, CA, passed away on April 14, 2007. Gerry retired from LAD in 1979 after 28 years of service.

MISSING SHEEP, BULLETIN RETURNED, NO FORWARDING ADDRESS
ROBERT L. JOHNSON – SAN CLEMENTE, CA
LLOYD C. COOK – BANNING, CA



PAX DOMINI SIT SEMPER VOBISCUM

The Press vs. The Generals

In view of the recent actions by the Congress and the Press in calling General David Petraeus a liar, the following seemed fitting.

"It appears we have appointed our worst generals to command forces, and our most gifted and brilliant to edit newspapers. In fact, I discovered by reading newspapers that these editor/geniuses plainly saw all my strategic defects from the start, yet failed to inform me until it was too late. Accordingly, I am readily willing to yield my command to these obviously superior intellects, and, I will, in turn, do my best for the Cause by writing editorials—after the fact."

—Robert E. Lee, 1863

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North American Aviation Retirees Bulletin

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IF THE DATE ABOVE YOUR NAME IS DECEMBER 2007 AND YOU HAVEN'T YET RENEWED –

THIS IS YOUR LAST ISSUE!



Photo courtesy of Curtis Fowles—MustangsMustangs.com

The best of American aviation descended on Rickenbacker International Airport, just south of Columbus, Ohio during the week of September 27 through 30, 2007 to celebrate Air Force Heritage Week. This included the Gathering of Mustangs and Legends, paying tribute to the P-51, one of the greatest fighter planes of World War II and the people that flew or built them.

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION Retirees Bulletin

Spring 2008

Inside:

BIRTH OF THE HOUND DOG by Ellis Katz
RECOLLECTIONS OF THE HOUND DOG by Ben Boykin
THE MANNED SCRAMBLE TO ORBIT by David Stern
"OLD LUCKY" by Clayton Kelly Gross



Photo from the Dr. Clayton Kelly Gross Collection

Considering himself very lucky and backed by a lot of prayer and a guardian angel, Clayton Kelly Gross stands in front of his P-51 Mustang which he flew with the 354th Fighter Group—the Pioneer Mustang Group. During his two tours of duty in the ETO—flying 105 combat missions with 6 air victories, a 1/2 probable and 2 destroyed on the ground—Kelly was assigned the P-51A, B, C and D models.

NORTH AMERICAN AVIATION
Retirees Bulletin

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Dear NAA Retiree Bulletin Subscriber

We begin the new year with an apology. We were overwhelmed in our last issue with too much material and several news items got left out, much to the disappointment of some of our readers. However, we hope to make amends in this issue with belated inclusion of these items. As is our custom, we looked over our list of subscribers and, although we gained some new readers, some of you old and dear friends and colleagues have taken flight and slipped away.

It is almost too much to fathom. How could a company that shot up like a brilliant comet streaking across the sky to become the leader of an expanding industry so quickly fade and die away, all in a period of fifty years? For old North American Aviation, we are the final memory, the last "Hurrah"!

In this issue we take a double look at the Hound Dog. In the dark days after the cancellation of the Navaho, the Space folks in Downey got a reprieve with a request to propose on what became the Hound Dog missile. Ellis Katz gives us an insight on the proposal team. Ben Boykin participated on the test team aboard the B-52 carrier aircraft evaluation of the Hound Dog attached to the bomber wing.

A new author has joined our burgeoning group of contributing writers. David Stern takes a look at the 1950s when the Space Race began and NAA, with its massive technical advantages, became a major contributor to getting America ahead and keeping our nation there.

Our final article resulted from a chance meeting by one of our readers with the author at the Gathering of Mustangs and Legends conclave in Ohio. He has written a fantastic book about his experiences during World War II and this is how he responded when we asked him if he would write an article for us:

"We must never let the name North American Aviation die! I would be happy to write for your publication. After all, I trained in the BT-14 and the AT-6 and flew the P-51 in two combat tours. I even had a few co-pilot hours in the B-25. North American never built a lemon! I give it credit for my survival."

Blue Skies,
Kelly (a.k.a. Dr. Clayton Kelly Gross)

I believe that this is one of the best product endorsements ever written. After you read his article, give a thought to ordering his book *"Live Bait"*. That is the name he gave each of his P-51s. For a personal touch, ask him to dedicate the book to yourself or to someone as a gift.

The 46th Bald Eagles Reunion will be held
on Saturday, April 12, 2008
at the Proud Bird Restaurant
11022 Aviation Blvd. (at 111th Street)

The Speaker will be:
Shep Hill – President of Boeing International
Doors Open for Social at 10:00 AM
Seating for Lunch at 12:00 Noon

Send your check for $22.00 payable to Bald Eagles Inc. to:

A. M. "Amby" Baccaro (310) 831-0945
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Include with your check the name you wish on your badge and the name of each guest included in your payment. Tickets and badges will be issued as you register at the door. Tickets sold at the door will be $25.00.
Sorry, no refunds after April 7, 2008.
Order your tickets NOW and order early if you want preferred seating.

There are no service requirements to attend – just the love for Airplanes and Spaceships

Meet old friends—Make new ones! Parking is limited—Carpool and Come Early!

Birth of the Hound Dog

by Ellis Katz

I joined the Missile Division of North American Aviation in Downey in May 1955 and was assigned to the Preliminary Design Section headed by Bill Parker. Reporting to Bill were Bob Wilson for Design and Bernie Chew for Operational Analysis. My background at the time was aerodynamics and missile design. I was identified as a Responsible Engineer under Gordon Olson and George Jeffs. As an RE, I was to lead teams on projects to which I was assigned.

On July 13, 1957, the North American Navaho program was abruptly canceled. The cancellation was a result of the successes of the Atlas ballistic missile program. The Navaho, a 3,000-mile ramjet cruise missile, was deemed as not competitive for the prescribed mission. Ironically, much of the success of the Atlas could be directly traced to the technology developed for the Navaho.

Only weeks after the cancellation, the Assistant Secretary of the Air Force invited North American to come up with a design for a "lightweight air-to-surface missile". It was to be carried by the B-52 bomber with a weight of not more than 12,500 lb fully fueled and armed. We were told it was a "hurry-up" project and that the concept had to be back in Washington within a week.

I was assigned the project under George Jeffs and recall working the weekend with a team which included Lou Walkover – best layout designer ever, Norm Ryker for structures – later President of Rocketdyne, "Bobby" Crawford (later Johnson) for aerodynamics – female member of our team and first-rate aerodynamicist, Fred Ethridge for propulsion – what Fred didn't know about propulsion wasn't worth knowing, and several others to evolve a design that might be acceptable. We based the configuration on the X-10/G-38 canard type to carry over as much data as had been complied on the Navaho program.

As I recall, Bob Wilson and Bill Parker carried the concept back to the Pentagon and later returned with smiles.

By that time, we came to know that we were in competition with Chance Vought who had an air-to-surface adaptation of their Regulus Navy shipboard launched missile. Of course, we didn't know then that the "dice were loaded" for us as consolation for the impending loss of the Navaho program. However, this view was later shared by many of us but not officially noted!

Although the general configuration of the first design was pretty much a scaled-down X-10, there were some significant configuration issues. Lou Walkover resolved the first issue: how to arrange the internal components (guidance & control, APU, etc.) of the bird so that they could be readily maintained while mounted under the B-52 wing. Lou immediately came up with the design that used a cantilevered "I-beam" projected from a forward bulkhead—all components would be mounted on both sides of the beam and easily accessible once the nose "cowling" was removed. Although there was some issue about the guidance system (pure inertial vs. a star-tracker system), we had no trouble settling on the Autonetics inertial autonavigational guidance system.

The major issue was the choice of the turbojet engine. General Electric had come up with the small J85 non-afterburning engine (I think it had been developed to power small commercial jets), which, in a two-engine configuration would be just sufficient to drive the bird to Mach 2.0 with the engines placed on either side of the after-body. GE had the test data to prove its case and we quickly (too quickly as it turned out) focused on that configuration. In fact, we had models made for publicity, which featured that configuration.

However, Pratt & Whitney came to us proposing that we use their recently developed J52 engine. The "advertised" advantage of the non-afterburning J52 was that a single engine might do the job, but the test data did not prove it would be adequate. So we sent P&W back to the showers. They came back with more data but still we were unconvinced. By late September, the competition was nearing a close and, as the project leader, I (and others) did not want any "changes" made at that time. How naive I was—P&W went to the Air Force and the Air Force came to us and with test data still wet on the paper, the J52 became the power plant of choice. Of course, as it turns out, that was the right choice.

In August 1957, Secretary of the Air Force James H. Douglas telephoned "Dutch" Kindelberger and told him that NAA had won the development contract.

I recall that Joe Beerer, the President of the Missile Division at the time, returning from Inglewood where he had met with "Dutch" Kindelberger and Lee Atwood regarding the contract award and telling us that it had been decided to name the GAM-77 as *"Hound Dog"*. At the time Elvis was "King" and his musical fame carried over to our bird.

On October 16, 1958, Headquarters USAF awarded a Hound Dog production contract to North American Aviation. With the award of the contract and the beginning of the production program, Martin Boe was named Chief Engineer and Sandy Falbaum Assistant Chief Engineer. I think that Dale Myers may have been named Program Manager. Being an advanced concept/preliminary-design type, I returned to Preliminary Design.

The design requirements called for a 350-mile range and Mach 2 speed at over 35,000 feet. The Hound Dog carried a 1,742-pound warhead—four megatons, approximately 500 nautical miles from its launch point at high altitude and supersonic speed, or approximately 200 nautical miles from its launch point at low altitude and subsonic speed. A B-52 could carry two of these lethal missiles.

Hound Dog was a highly successful program and an important revenue source for North American in the post-Navaho period. Most importantly, it kept a very talented cadre of engineers together for the eventual competition and development of the Apollo/Saturn programs.

About the Author: After graduating from Georgia Tech in 1943, Ellis joined Bell Aircraft in Marietta, Georgia as a liaison engineer on the B-29 production line. In 1945, he joined NACA at Langley Field as an aerodynamicist in the Pilotless Aircraft Research Division. By 1951, he moved to Fairchild Guided Missiles as a project engineer on the Lark and Petrel Missiles. His service with NAA began in 1955 at Downey and came to an end in 1987 when he retired from Seal Beach as Director of Systems Engineering, Saturn II. Ellis currently resides in Encino, California.

Recollections of the Hound Dog

by Ben Boykin

I joined the North American Aviation WS-131B "Hound Dog" Program in January 1958, having transferred from Data Engineering under Jack Grimes on the cancelled Navaho Program. Dale Myers was the WS-131B Program Manager, Sandy Falbaum was also in Program Management and a later Program Manager. Gary Osbon was the Chief Engineer. Bob Coburn was an Assistant Chief Engineer to Gary Osbon. As a personal note: I thought of Gary Osbon, at that time and still do today, as a classic and very technically proficient Chief Engineer—as good as they come.

Initially, I was in the Flight Test Plans and Operations unit under Nick Carter who worked under L. A. Williamson. I recall my first assignment was working with Mark Morris developing the test requirements for the Hound Dog House Missile. This was a dedicated Hound Dog vehicle that would be used to run all individual system tests and end-to-end systems integrated tests to verify hardware integrity and operational success prior to any flight. Bill Dunham subsequently became the Supervisor of the Hound Dog House Missile.

Parallel to the House Missile operations were two Staging Test Operations where the actual test vehicles would be processed. These two test areas were supervised by Jim Michaels and John Hayes.

As the program progressed, and since I was a recent former active duty Air Force fighter pilot, I was asked if I would be interested in being the Flight Test Engineer on the WS-131B Dummy Missile Program to be run at the Boeing Airplane Company Seattle plant. This program was to determine the flight characteristics of the B-52 with one or two "Dummy" Hound Dog missiles attached to the left and right wing, inboard of the B-52's inboard engines.

Chuck McKim was the NAA Instrumentation Engineer that was in Seattle for this Dummy Missile Test Program. Wendell Garton and "Hetz" Hetzel were the NAA test pilots that flew the B-52F with the Boeing test pilots. All the other participants were Boeing personnel. This is where I met Bill Blair who, at that time, was a Boeing copilot on the B-52 in this Dummy Missile Test Program. Bill later joined North American and became supervisor at the Johnson Space Center for the North American systems group that supported/backed up the NASA Mission Operations Flight Directors.

The Dummy Missile test operations involved many B-52F test flights with many different configurations of varying fuel loads and off-limit flight conditions with one and/or two Hound Dogs installed. There, also, were many extreme yaw and shudder tests conducted with different gross weights as well as slow speed and fast speed stall sequences to see how the B-52F responded with the one and/or two Hound Dog dummy missiles installed. An example of these extreme tests were intentional yaw induced tests performed by kicking hard right rudder and then hard left rudder several times to get the B-52F in an exaggerated yaw condition and then to get off the rudder and let the B-52F dampen out, all the time recording aerodynamic and structural load data on both the B-52F and the



Photo from the Ben Boykin Collection

A dummy Hound Dog attached to the B-52F left wing pylon at the Boeing Flight Center in Seattle prior to extensive flight test.

Dummy Hound Dog(s). The Dummy Hound Dogs were also instrumented to measure the aerodynamic and environmental conditions encountered and how the Hound Dog responded to the effects of the B-52F.

I recall one maximum fuel load take-off test flight of some 452,000 pounds where the only objective was a maximum weight takeoff to see how the B-52F performed. Completing takeoff, we had to fly for some four hours at low altitude with landing gear down and flaps hanging out at high throttle settings to burn off the excess fuel to get down to the safe maximum load for landing. We flew up and down the coast of Washington State and around Mt. Olympia numerous times and the views were spectacular at about 2,000 feet.

The flight plan for one test flight required an above 50,000 feet altitude, so the entire crew was outfitted with the high altitude pressure suit (the Poopy Suit). We only wore it once and it was not the most comfortable flight garb.

Since my duties as Missile Operator had no real in-flight duties, i.e., only a dummy missile, Boeing trained me to perform their in-flight fuel management and fuel transfer schedule. They had a specially designed fuel management "slide rule" and I was assigned the task of maintaining the B-52F center of gravity (CG) during flight as the fuel was burned from the wing and main body tanks. Once I got the hang of it, I became proficient at keeping the CG exactly where the flight plan requirements specified with continual fuel tank monitoring and transferring of fuel between the various tanks as the fuel level decreased.

Between October 1958 and January 1959, I logged almost 60 hours in the B-52F during this test operations period.

The last flight of this series, after flying from Seattle to Eglin AFB, Florida in early January 1959, was to successfully launch Dummy Missile D-2 over Eglin Range 70 to assure proper and safe separation of the Hound Dog missile from the right in-board wing of the B-52F and to evaluate any effects of the separation on the B-52F.

All flight tests of these configurations were successful and that ushered in the actual flight test program with operable test Hound Dogs and the eventual production program for the Air Force.

I had an opportunity to go to Eglin AFB as a Missile Operator and finish the Dummy Test Program and go on to the active flight test program but declined that offer and became the supervisor of the Test Requirements and Planning (TR&P) group working under Bob Coburn, and later, Bob Weaver. As it turned out, Ted Clauss accepted the Eglin AFB assignment and finished that phase of the program.

In the Test Requirements and Planning (TR&P) group, we were responsible for coordinating and preparing the tests requirements for all the development test vehicle flights and monitoring the test operations for Program Management at Downey in coordination with Eglin AFB. Test Operations were staged out of Eglin AFB to Cape Canaveral, Florida, and to the White Sands Missile Range in New Mexico. TR&P issued a one page Daily Quick Look Report to management, reporting on the previous day's test operations. We also operated a "real time" Mission Operations Room, monitoring test operations in Florida. I guess you could say it was the precursor to the Apollo/Shuttle Mission Support Room (MSR) operation. Some of the personnel in the TR&P group were Bill Beckner, Ernie Everett, Vern Dobbs, Gene Dryer, Ted Clauss, and Jim Blevins,



Photo from the Ben Boykin Collection

An unusual view of the B-52F from below with a WS-131B Hound Dog mounted on each wing.

and others that were very senior in experience with the old NAA "gray badges".

The WS-131B "Hound Dog" operational vehicle, launched from the B-52 aircraft had had several trajectories available. It could launch at high altitude, with a dogleg turn; it could launch at high altitude with a maneuver to a lower altitude; it could launch at a low altitude with a maneuver to a higher altitude, with or without a dogleg turn. The computer system was the Autonetics VERDAN computer system, the precursor to today's GPS systems. It should be also noted that the two Hound Dog engines could be used as additional power for the B-52.

As the Apollo Program began to come up to speed, the Hound Dog Program personnel were transferred to the Ferguson Facility off Atlantic Blvd. and down I-5 in East L.A. and eventually were transferred to the NAA Tulsa facility in Tulsa, Oklahoma. I transferred to the Apollo Program in Ray Pyle's Project Engineering office in January 1964.

About the Author: Ben is an old friend of the Retirees Bulletin, always ready to provide helpful suggestions and encouragement. In 1957, he joined the NAA Space Division where he held key assignments on Navaho, Hound Dog, Apollo, Skylab, Apollo/Soyuz, Space Shuttle and STSOC in Downey and in Houston. In 1994, he joined AlliedSignal as Program Manager at the NASA White Sands Test Facility in New Mexico. He is retired now and resides with his charming wife, Janis, in Las Cruces, New Mexico.

The Manned Scramble To Orbit

by David Stern

INTRODUCTION

During the 1950s' Cold War, space and space travel was laughingly derided as sci-fi Buck Rogers and Flash Gordon comic-strip and Saturday Matinee material, rather than everyday reality. Nonetheless, sporadic rocket, space travel, and lunar project articles were published after details of captured V-2 rockets were released to the public, and while they were being launched at White Sands, NM after WWII.

Very few within the USAAF cum the USAF officer corps publicly verbalized the term space, satelloid (a term boldly suggested in 1955 by ex-German Peenemunde engineer Krafft A. Ehricke), satellite and orbiting space planes called skip-gliders and rocket-gliders.

Officers were admonished to refrain from using such terminology and/or encouraging plans for U.S. manned spaceflight (a warning ignored by a small cadre of open-minded USAF officers who worked behind the scenes on rocket and missile projects).

Our bold German rocket scientist Dr. Werner von Braun, popularized space stations, lunar exploration and lunar bases, plus rocket powered canard space planes as Martian Expedition vehicles, through a series of Colliers magazine articles around 1953 that, at the very least, challenged the imagination of the American public.

A few years later, the Soviets publicly announced intentions of launching a satellite into orbit in cooperation with the IGY (International Geophysical Year spanning the period July 1, 1957 to December 31, 1958).

Their announcement either slithered through the U.S. intelligence community's awareness level or was ignored because it was believed to have originated within the KGB's Department of Active Measures—the infamous "Service A" or *dezinformatsiya* (disinformation) bureau.

Indeed, as late as 1957 (obviously prior to the Sputnik launch), Pentagon officials literally rebuked General Bernard A. Schriever for suggesting that USAF missiles would be capable of launching men into space. He too, was warned to refrain from applying the word space in any of his speeches.

To this day, the American public still remains unaware of how psychologically traumatized were the egos, nervous systems and minds of our government and military hierarchy, when little Sputnik was successfully inserted into orbit on October 4, 1957. Service chiefs, politicians, government civil servants and scientists, correctly voiced prophetic fears that Soviet satellites would become photoreconnaissance platforms, nuclear weapon launchers and—*GASP!*—eventually lead to putting Russians in orbit!

The greatest and still hidden government fear was that the Soviets would secretly orbit psychotronic satellite platforms. While Sputnik orbited Earth, the once prohibited terms such as space, satellites and spacecraft projects became immediate priorities that also expanded into an "aerospace" lexicon of new terms and acronyms. The level of American paranoia and panic was reflected in the plethora of good, bad, ugly, and dangerous piloted spacecraft proposals being created by the engineering teams of many American aircraft corporations.

They even suggested initial one-way lunar exploration missions to establish bases on the Moon before the Russians completed their one-way trip to the lunar surface, landed and drove Cyrillic inscribed stakes into the soil and died there. The political egocentrics in both nations justified one-way piloted lunar missions to get their first; ours was the Cord-Seale One Way Manned Space Mission (neither man volunteered to make this one-way trip), placing a man on the Moon to claim and explore it, with no immediate means of returning to earth.

Meanwhile, a supply vehicle would hopefully land nearby with food, water, and oxygen for the astronaut to survive until rescue ships were built (the actual word used was "built"), to retrieve him, while he waited and prayed!

Should the rescue vehicle fail just above the launch site or while approaching the moon, our man would be provided with a WWII OSS-style "L" pill or an updated version, thereof, to use after being hailed as a true hero.

Some proposals were sound, but others generated literal accusations that certain engineers had graduated from the RGI—the "Rube Goldberg Institute of Technology". Numerous Air Force project and Civil Service officers with aeronautical engineering degrees read and filed these proposals; many never became part of the public domain.

Although Bell Aircraft's Model D-171 rocket plane lost to the North American X-15 project, their engineers under the direction of Dr. Walter Dornberger, were secretly engaged since 1951, in researching and designing hypersonic orbital boost-glider projects—winged extensions of the supersonic airplane.

Mission descriptions were orbital photoreconnaissance, launching nuclear weapons from orbit, supplying and servicing orbital bombardment stations or military space stations and, hopefully, survive reentry to glide-land without barbequing the crew.

Bell's exotic winged orbital vehicles were the forerunners of our current STS or Space Shuttle. They bore such unique acronyms as BoMi (Bomber Missile), RoBo (Rocket Bomber), RS-459L Brass Bell, System-118P (QUEST History of Spaceflight Volumes 13 Number 2 and 4, Secret Boost-Glider Projects of the Cold War). In 1957, they were combined into the Abbreviated Development Plan designated RS-464 or Dyna Soar I. Even before the USAF issued the RFP (Request for Proposals) letters for RS-464L Dyna Soar I, NAA engineers were studying a way to achieve earth orbit with available hardware. North American engineers obviously were given permission or decided to perform engineering studies to orbit an American airman.

Despite the fact that the North American Aviation X-15 initiated gliding flights on June 8, 1959, the Engineering Department on June 8, 1957, created a proposal to rapidly modify and boost several X-15 research and reconnaissance vehicles, into sub and low earth orbit tracks, and submitted it to the USAF.

THE NAA ORBITAL X-15 SPACE PLANE

The secret technical summary describing an Advanced X-15 Research Vehicle is dated 27 November 1957, and was approved by F. A. Payne, Chief, Preliminary Analysis Section, and H. A. Evans, Manager of the Weapon System Advance Design within the Engineering Department.

NAA qualified this proposal by referencing the expertise gained through the Navaho booster program, the advanced design fea-

tures of the X-15 research aircraft, the development of the large rocket engine and the advanced guidance systems experience.

The Engineering Department proposed a three-step program: Step I utilized a generic X-15 (31,250 lb gross) strengthened to mount directly atop a Navaho G-26 sandwiched between two parallel mounted G-26 boosters to achieve research flights reaching 10,850 fps and a 1,115-mile range.

Step II was an X-15A (34,850 lb gross) with the standard X-15 exterior dimensions, the XLR-99-RMI engine and fuel system but alternate structural materials to survive blistering skin temperatures up to 1,600° F for short periods, and a reinforced aft fuselage to mate atop a parallel strapped together G-38 booster. The two-stage beast would ram the X-15A at 16,570 fps down range 1,741 nautical miles with photoreconnaissance equipment.

Most ambitious was Step III, a modified X-15B (40,200 lb gross) with advanced propulsion and airframe systems, but nearly identical to the basic external X-15 design. The very heavy X-15B far exceeded the weight of any Dyna Soar I proposal from the Martin-Bell and the Boeing-Vought teams.

A 60,000 lb sea level thrust (75,000 lb at operating altitude) single-chamber variable thrust Rocketdyne S-4 engine burned fluorine and hydrogen—a combination that promised higher specific impulse ratings than LOX and alcohol or kerosene.

Two G-38 boosters comprised the first-stage and one single G-38 sandwiched between them, became the second-stage booster with the X-15B perched on its nose. In order to achieve the necessary orbital insertion speed, several Navaho booster combinations were designed to thrust an advanced X-15 to 25,000+ fps.

THE THREE PLANS

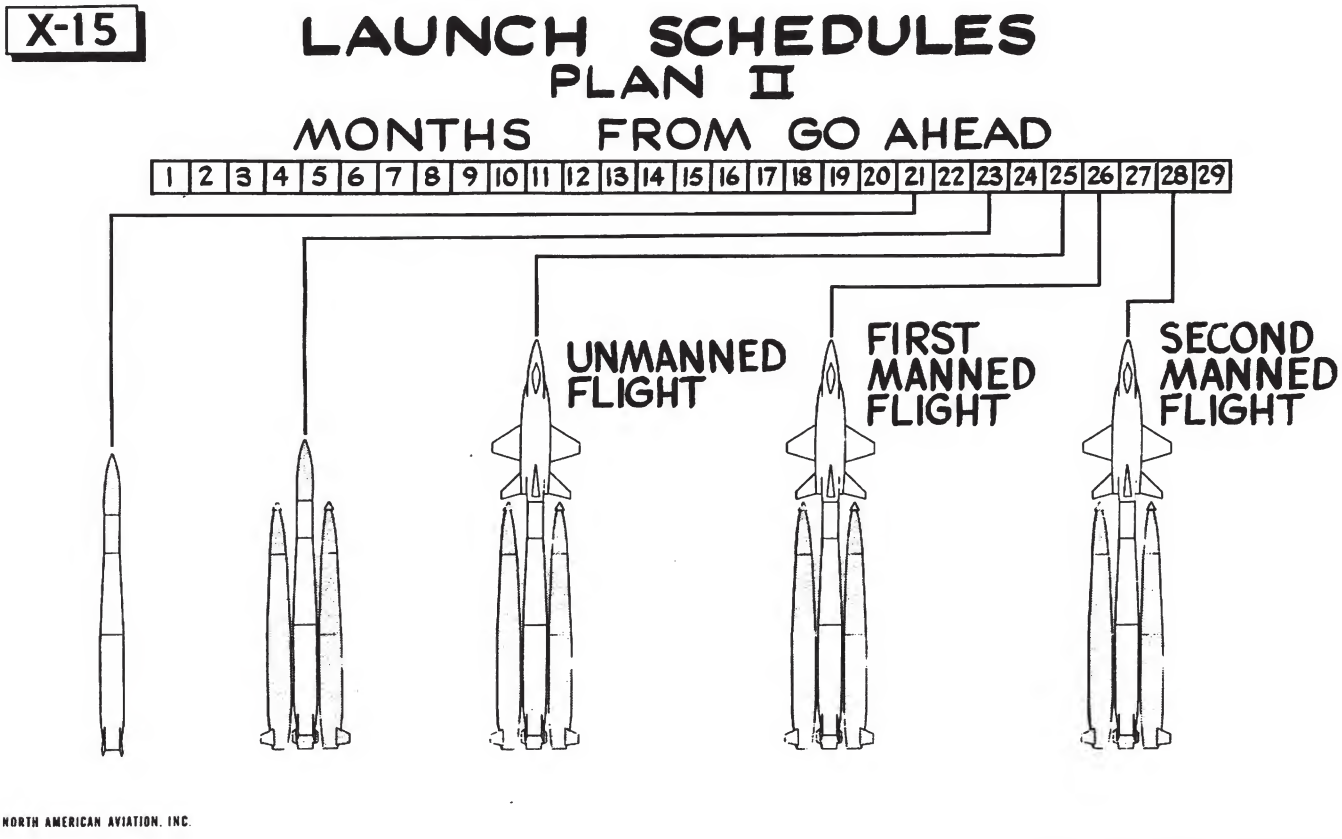
The NAA Advanced Weapon System Advanced Design office backed up the three-step program by sending the USAF Report Number NA-58-195, their accelerated "Advanced X-15 Program Expedited Plans" a fast-moving Basic, Plan I and Plan II schedule for the X-15 to achieve manned orbital flight.

The Basic and Plan I called for one X-15B propelled skywards from Cape Canaveral, by three parallel attached G-38 boosters weighing 595,000 lb, generating 830,000 lb of thrust.

Plan II offered a modified 31,250 lb X-15 atop three parallel-attached G-26 Navaho boosters weighing 341,500 lb that rocketed to orbit on 720,000 lb of thrust. The Navaho booster thrusting the XLR-99-RM-1 powered X-15 would burn liquid oxygen and RP or a fuel called Hidyne, in Stage I and FLOX and RP in the Second stage with re-gimbaled engines utilizing a different nozzle design.

The X-15B pilot's aerodynamic control authority was transmitted through irreversible hydraulic controls but while in orbit, Bell Aircraft's miniature hydrogen peroxide attitude control engines maneuvered the vehicle, via controls mounted on the port side-console. Two solid-rocket engines would be mounted in the X-15B fuselage, their axis passing upward through the aircraft's CG point.

The pilot fired them to move the X-15B from its circular orbital path into an elliptical orbit just prior to initiating re-entry. Upon successfully negotiating the critical re-entry phase of glide flight, the pilot, protected within a full-pressure suit with integrated restraint harness, anti-g protection and ventilation, exited the X-15.



Schedule Graph from the David Stern File

An ambitious NAA Plan II to launch and complete two manned launches within 28 months was proposed using G-26 and G-38 Boosters coupled to a modified X-15B.

Pilot egress was accomplished via a rocket-catapulted ejection seat, equipped with a shock wave generator, stabilization fins, head and limb restraint, and an automatically timed separation and parachute deployment system. After the wild exotic ride around mother Earth, and successfully negotiating a potentially lethal re-entry, the pilot was expected to eject and land on solid ground, near or well within the Eglin Field Range.

To cool the X-15 airplanes during the re-entry phase, NAA engineers chose the simple radiation method of heat transfer and cooling. It would hopefully allow the X-15B fuselage, its 5-percent wing with 2.5 aspect ratio and tail section, to sustain short-period temperatures to 3,500º F, in stagnation areas by means of exotic metals and ceramic materials derived from ICBM nose-cone research. This was approximately 1,000º F higher than Bell Aircraft engineers projected for their piloted rocket-gliders during reentry.

An alternative metal to protect the airplane to 1,500º F was to apply nickel-based Rene 41 (created by General Electric for turbine engines), throughout the primary fuselage structure, and a black finish to achieve maximum heat radiation from the overall aircraft. Other metal candidates mentioned were molybdenum and Haines-Stellite Hastelloy R235, although Rene 41 appeared to be the metal of choice to replace the primary aluminum and titanium structures and critical heat-bearing skin areas.

The wing leading edges, nose, and tail surfaces would be coated with ceramic material to withstand projected temperatures up to 3,400º F during reentry.

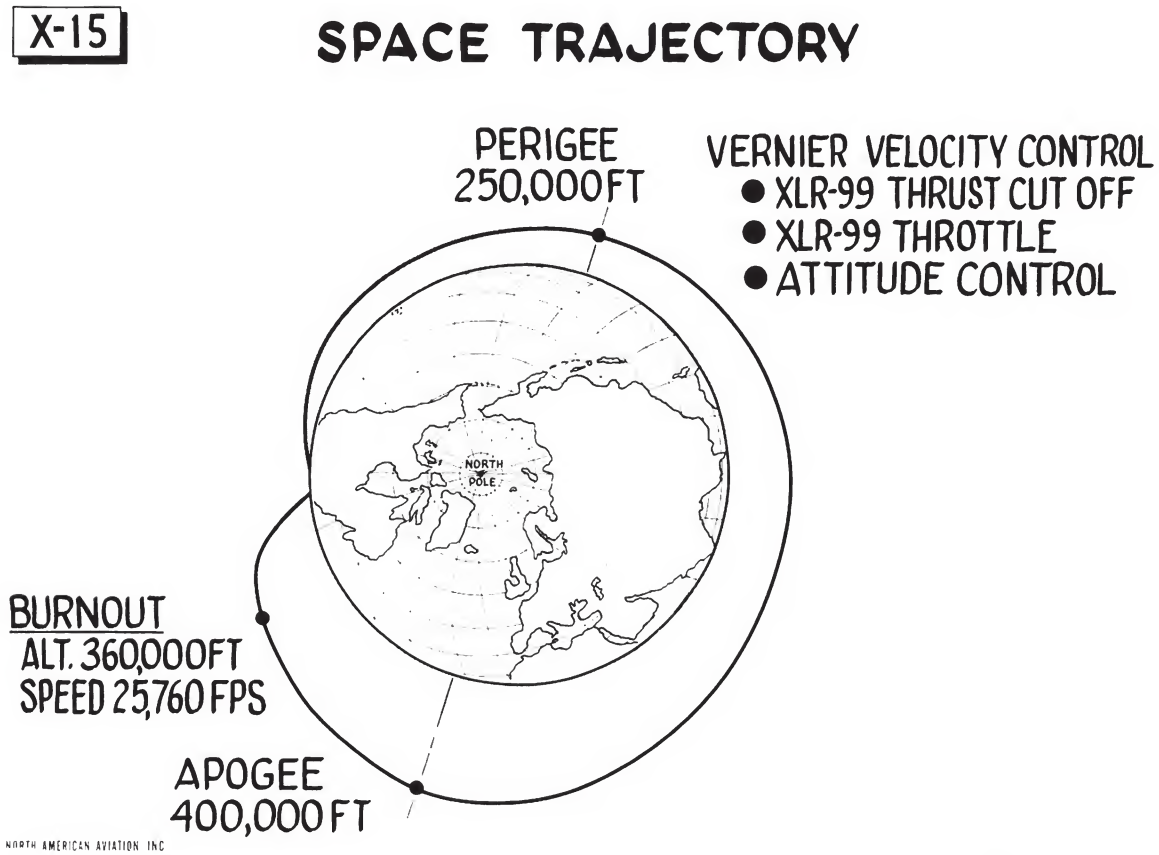
The cockpit and instruments would be insulated and refrigerated with liquid nitrogen that also pressurized the cockpit to 3.5 psi, and doubled as a defroster and defogger for the transparent ports or windshield.

NAA engineers included a full instrument suite, portions being removable and replaced with high-resolution reconnaissance cameras in the X-15A and B models. This reconnaissance suite would comprise one high-speed and one standard motion picture camera, a Tri-metrogon installation with one T-11 camera, and a K-40 aerial camera.

Although Martin-Bell and Boeing-Vought were slugging it out over the Dyna Soar I contract, all three NAA X-15s were unofficially competing as well, even during North American's complicity in studying rocket powered and air-breathing mother ship air-launchers for Boeing's Dyna Soar I gliders. However, the X-15A and B models were far heavier than all of the Martin-Bell and Boeing-Vought Dyna Soar I glider proposals, by roughly 18,000+ lb. One exception was the heavy enlarged Martin-Bell Dyna Soar I nuclear reentry missile carrying orbital bombardment proposal, which was roughly similar in weight to the X-15B proposal.

Piloted orbital flight required that all three X-15 vehicles and the G-26 and G-38 boosters be "man-rated". This procedure demanded that pilot safety be paramount and that systems and components had to exhibit extremely high degrees of reliability.

The time and expense to achieve this rating would have rendered the X-15A and B proposals a moot engineering exercise.



Flight Plot from the David Stern File

NAA proposed to launch an X-15B from Cape Canaveral into Orbital Trajectory for single orbit with egress and recovery of pilot at Eglin Proving Grounds.

Also, the center G-26 and G-38 boosters required structural modifications to support the weight of the heavy X-15A and B, mounted directly on top of the center booster.

A standard launch would induce great compression loads upon the X-15, thus demanding increases in certain load-bearing areas of the fuselage. As to the G-26 boosters, the first stage lifted slowly thus imposing no severe aerodynamic loads upon it.

However, the second stage necessitated modifications to the backbone and additional beefing up with longerons in the upper portion of the booster that would in turn, attach to the three engine mounting longerons of the X-15.

The aluminum alloy G-26 and G-38 structures were also calculated to absorb around 520º F during a one-cycle booster life.

However, only the Delta-wing X-15 may have qualified for orbital flight with another booster, due to the extreme aerodynamic, acoustical pressures and prolonged heat of reentry into the Earth's gaseous envelope that boost-gliders or Lifting Body vehicles were specifically designed to endure.

Although the competing Dyna Soar I team of Martin-Bell known as the BOMI Division, lost the Dyna Soar competition to Boeing-Vought cum Boeing-Martin, Bell early in its secret boost-glider studies, was USAF funded to design and construct test specimens of their patented double-wall water-glycol and solid insulation cooling system. It held promise of actually insulating and cooling an aluminum airframe boost-glider through reentry and would last for several missions, before airframe fatigue and failure consigned it to the scrap pile.

In 1960, Bell Aerosystems engineers proposed an engineering plan to graft a portion of their double-wall hot-structure insulation system onto the forward fuselage of an X-15. Known as the "X-15 Double-Wall Program," it would endure actual hypersonic conditions, being exposed to aerodynamic pressures, acoustic loadings, rain, heat, and other conditions to determine its durability and reliability.

Test panels were installed on the prototype B-58 Hustler even as it completed the USAF-Convair supersonic flight-test syllabus, while other panels endured punishment in high-speed wind tunnels.

The orbital X-15, X-15A, X-15B and Navaho boosters are now historical engineering exercises created to quickly reach orbit after the initial Sputnik fright. The author is unsure whether this engineering data was applied to the final X-15A-2.

Had an X-15 actually been constructed and successfully orbited, optical tracking station personnel, with their Baker-Nunn and/or Super-Schmidt cameras, would have been tasked with spotting, tracking and photographing the X-15A or X-15B ripping by in low Earth orbit.

If declassified, they would have become sensational American aeronautical classics, while their standard X-15 brethren accomplished their historic USAF-NASA hypersonic flight test program.

About the Author: A prolific writer for the AAHS Journal and a published author of aviation/aerospace history, Dave delved into the National Archives to research material for this article. A licensed helicopter pilot in the Alaskan bush, he has done extensive work within the USAF NORAD Space Surveillance program and for RCA and ITT. He is currently completing a book on the Bell Aircraft-designed secret boost-glider projects of the 1950s. Dave now resides in Renton, Washington.

Death of the Dyna Soar

The X-20 Dynamic Soaring or "Dyna Soar" vehicle was one of the earliest American proposed space programs. A purely military vehicle, it was inspired by the World War II Sanger-Bredt Silverbird intercontinental skip-glide rocket bomber that Nazi Germany envisioned for the Luftwaffe. German scientists who had worked on this project came to Bell Aircraft after the war and pitched the idea to the Pentagon. Naturally, the Pentagon put out a request for bids on the project and awarded it not to Bell, but to Boeing.

As with the International Space Station decades later, the X-20 went through many changes in mission and configuration. In 1962, the Air Force selected the men to fly the X-20 including later X-15 pilots William J. "Pete" Knight and Milton O. "Milt" Thompson.

Then-Secretary of Defense Robert S. McNamara was never a big fan of the X-20. He wanted the Manned Orbiting Laboratory (MOL) program instead, and so he subjected the X-20 to what became known as "paralysis by analysis"—a common tactic of his, wherein a popular program he didn't like would be subjected to endless requests and inquiries and other such nonsense. When members of Congress got wind of the resulting delays and cost overruns, they would launch their own investigations, cry foul over the budget and bury the program in its own paperwork until they had no choice but to cancel it. Then McNamara would have an excuse to champion his own program, which would seem cheaper by comparison.

Accordingly, one year after the X-20 pilots were named, McNamara announced the cancellation of the X-20 Dyna Soar project at a news briefing on December 10, 1963 at the Pentagon.

And, that's how the X-20 Dyna Soar became extinct.

Editor's Note: This account of governmental direction provided for the Dyna Soar program has all the elements of the constipational results achieved by the current Congress in its race to accomplish nothing.

"Old Lucky"

by Dr. Clayton Kelly Gross

I guess you could say North American Aviation and I go back a long way. I flew my first NAA aircraft, a BT-14 on May 4, 1942 at Randolph Field, Texas. How did a young cadet from Spokane, Washington get to this S.W. Training Center? It so happened that I was a very good bowler and Gen. John B. Brooks, commander of the 2nd Air Force at Geiger Field in Spokane, loved game watching me and asking for instructions. When I told him that I had passed the entry requirements for the Army Air Corps, he said I must go through Randolph Field where he once commanded. "It is the West Point of the Air", he said. "I'll fix it", and he did. That which defined my life forevermore began there.

I can think of one thousand lucky things that happened to me in life and who knows how many happened that I didn't recognize or even know.

I did recognize the government program that made Civil Pilot Training (CPT) a reality and gave me a chance to fly. I was an impressionable teen who had thrilled to the movie "I Wanted Wings". I figured all pilots would get a girl like Veronica Lake. Actually, I got a prettier one!

I announced that I wanted to fly. Mother said flying was too dangerous and my father, who had experienced the Great Depression along with the rest of the country, said, "No way. It cost too much!" Civil Pilot Training changed that. Through Gonzaga University, I enrolled and was accepted.

It began with ground school in night classes which I tolerated because their successful conclusion led to flying! First, in a Porterfield, which I soloed in January1941 and in which I earned a Private Pilot License after 40 hours. With that much experience, I took my little brother for a ride and managed to make him air sick. That didn't deter him since he had over 5,000 hours in a 20-year Air Force career.

After the Primary phase of CPT, I graduated to the Second phase and into flying a Waco UPF7 biplane with helmet and goggles like a real pilot. So it was that I had 80 hours flight time before my military career began.

I consider myself lucky in my next choice. Both the Army and Navy brought flight training programs through Spokane and I took and passed both. I was told to make up my mind. Now I faced another choice. The world was at war, although we weren't. I reasoned that if we entered combat and I was in the Navy, my landing area might not be there when I returned. In the Army, I reasoned the field might have holes in it, but it would still be there.

I chose the Army Air Corps and was put on a waiting list.

I was lucky, in a way, that I had those 80 hours in the air when the Japanese attack at Pearl Harbor brought America into the war. I got an immediate order to report for flight training. I said "in a way" because I may have been a little overconfident and found an instructor or two who found it necessary to bring me "down to earth".

Flight school training was really not a problem for me. I breezed through Primary Flight School in a Fairchild PT-19A and that got me to Randolph Field, which did impress me.

Seventy hours in the BT-14 and I moved on to Kelly Field and another North American Beauty—the Classic AT-6!

The real luck came at the end of the Advanced Phase and graduation!

A few weeks before that great day, we were called into convocation and issued a paper to print our name and serial number and four lines on which we were to list our first through fourth choices of aircraft to fly after graduation. There was also an admonition... *"If you are 5 feet, 11 inches tall or over, you may not request fighters"!*

Damn! I was 5 feet, 11-1/2 inches tall! Well, another really lucky thing was about to happen to me. The prettiest girl in the whole wide world had agreed to marry me on graduation day and I would hate to leave her immediately to fight the war.



Photo from the Dr. Gross Collection

Impressive rows of North American BT-14 trainers at Randolph Field, the "West Point of the Air", circa 1942.

So, I listed:

1. Instructor
2. Light Bombardment
3. Medium Bombardment
4. Heavy Bombardment

With graduation and marriage came my orders.

"Report to the 328th Fighter Group at Hamilton Field, California." Wow! Was I the luckiest guy in the world or what?

I began to be a fighter pilot in earnest with the 328th F.G., a replacement training unit. Incidentally, my first Flight Leader was Harry May, a 6 foot-7 inch tall former Stanford basketball player. What happened to the 5 foot-11 inch rule? I guess that was luck; to discover not to believe everything the Army Air Corps said – as gospel.

The 328th was equipped with the beautiful little Bell P-39. It certainly impressed this new graduate. I would find with other survivors, that it might not be an adequate machine to fight first-line German or Japanese fighter.

We lost a lot of pilots in training because the P-39 Airacobra had very different flight characteristics with the engine located behind the pilot instead of in front.

I personally had no problem with the airplane. I found in time that I could whip anything the Navy had in the San Francisco area, primarily F4Us and F4Fs.

Months into training in the replacement group, an opportunity came to move along. It was common knowledge among the pilots that the beautiful little Airacobra was not good enough to use against our enemies' top planes. The Government couldn't let the public know that and so one of our top three fighters, the Lockheed P-38, the Bell P-39 and the Curtiss P-40, was selected for a giant propaganda effort. "The P-38", the public was told, "Is a fantastic airplane!" The pilots believed it along with the rest of the country. Why would the Government say that if it wasn't gospel? A few weeks later, the 328th pilots were called to a meeting.

"Half of you will be relieved here and assigned to a P-38 fighter group." I was on my feet, along with most, hollering, "Take me! Take me!"

Probably the luckiest break of the war happened to me, although I didn't recognize it at the moment. I wasn't one of the chosen.

A few weeks later I would be one of the first twelve pilots assigned to a new Operational Fighter Group, the 354th which would in time become famous as the first group to fly the Mustang into combat and to shoot down more enemy aircraft from the air than any other group in WWII. My luck had definitely held true. A year later I met some of the 328th group that were in the P-38s on the streets of London and I would console them – maybe, buy them a drink!

In September 1943, the 354th was finally on orders. When we arrived in the U.K. after a two-week voyage in a huge convoy, we still had no idea what we would fly. Three pilots from the Group were given a Jeep and a map with orders to go to an RAF base to check out a new fighter. I was one of them along with Jack Bradley and Bob Stephens. Upon arrival we found the planes were the P-51A or Apache as the British called them. My first flight, actually, was in an A-36, the dive bomber version of the wonderful P-51.

We had several flights in the "A" model before returning to our English base to check out the other pilots. True to USAAC procedures, we found that most had already been checked out at another base.



Photo from the Dr. Gross Collection

Kelly Gross pauses in front of one of his P-51s at a forward base in the ETO.

We soon left our temporary first home in the war zone for Boxted near Colchester where we would begin our part of the war against the Axis.

I had considered the "A" model a very good fighter, but as our planes were delivered, we found we had the "B" model with the Rolls Royce engine! Now we were talking G R E A T fighter! Was I lucky or what?

Before the war ended, I would fly 105 combat missions in the "B", "C", and "D" models. Over 400 combat hours in two tours without a bodily scratch, although many of my planes, all named *"LIVE BAIT"*, experienced numerous perforations from enemy action.

On one mission to the Berlin area, I was in a gigantic air battle and I found myself alone. I was on the "tail" of a Messerschmitt Me 109, but smart enough to "check six" before I started to fire. I found two red nosed P-47s coming in behind me. "Great!" I said, "I got help." I opened fire and observed multiple hits on the Me 109 before the world exploded. I felt as if I had had a baseball bat across the back of my neck. A good part of my canopy had disappeared. *"LIVE BAIT"* did an involuntary snap roll and went into a spin. A few thousand feet lower, I discovered I was still alive and made a spin recovery. The P-47s came in for the kill but I vigorously rocked my wings and, luckily, they finally recognized me. I had hundreds of holes in my P-51 but the engine still worked and I did get home.

I did lose one of those gorgeous machines – a "C" model that had become one of my favorites for its better visibility with the

Malcolm Hood. Strafing at a low altitude, I was hit by rifle fire through the engine and liquid-cooled engines don't work without coolant. I had to bail out. The "Controller" told me told me I had "40 miles to our lines – can you make it?"

"Forty yards is about it", I replied. But guess what? Patton was 40 miles ahead of where they thought he was and I came down in the middle of a battle zone. I didn't get hit and was picked up by two GIs in a captured German half-track. I spent the night with the Third Army before being flown back to my base in an observation plane the next day. Am I lucky or what?

Let me interject a little discussion of the P-51 vs. the P-47. I continue to get letters asking which was the better fighter. Many of us in the 354th knew—we had flown both.

We initiated the P-51 into combat in December 1943. In late 1944 they took away the Mustang and outfitted us with the P-47. We flew that monster in combat until March 1945.

There is good to be said about the P-47. Its eight .50-caliber machine guns had tremendous power. I actually tipped a boxcar over strafing from 90 degrees. I also experienced that power when the P-47s mistook me for an enemy plane. It would absorb great punishment and continue to fly. I took a 20 mm hit in my engine while dive bombing at Bastogne. I didn't even know that I had been hit until I landed. On the other hand, a single rifle shot through the engine of my P-51C brought me down.

Now ask me which aircraft I would rather fly in combat! The Mustang, without question, and I never met a pilot who flew both to say any different!

When we got our P-51s back in early 1945, the cheer was probably heard in Berlin.

I finished my second tour just as the War in Europe ended. The 354th Fighter Group—the "PIONEER MUSTANG GROUP"—had over 700 confirmed aerial victories to lead all fighter units in that category.

I had personal success in the confirmed destruction of six enemy fighters from the air and two more confirmed ground victories. One of my air victories was an Me 262 German Jet. I got him with my little old P-51. He was at 2,000 feet and I was at 12,000 feet and he didn't see me coming! I met the pilot, who was wounded but ejected safely, at a German Fighter Pilot meeting in 1995. He thanked me—because he didn't have to fly anymore and so he survived.

Our group did not reach that leading total without cost. Reaching the War Zone in 1943 with about 90 pilots, we lost 187 killed or captured—more than a 200 per cent loss! Still, we felt we were lucky—especially me!

EPILOUGE

When I returned home after the war in Europe ended, I fully expected to go to the Pacific where the war still raged. Imagine my surprise when a 2-1/2 ton truck brought a group of returning combat veterans to Ft. Lewis, Washington. A corporal with two clipboards stopped me as I started to jump down from the truck. "You all have enough points to be separated. I need to know if you will get out or stay in."

This was after four years of flying with the U.S.A.A.C.—never ever thinking about the end of it all. I hesitated. "I will call my wife and let you know", I replied. "No sir", he replied. "I need to know before you leave the truck". I turned to the pilot behind



Photo from the Dr. Gross Collection

"Kelly" Gross, a Knight of the Air, in the cockpit of his favorite steed, the P-51 Mustang.

me and said, "If this is what the Air Corps is going to be like in peace time—I'm outa' here" and told that to the corporal!

My wife was equally surprised when I told her the news. In due time, we went to Spokane where I bought some new civilian clothes and settled down. I bought a beer tavern and restaurant with my poker winnings. However, my time away from my beloved "Mustangs" didn't last long. A month later I received a call. The Washington National Guard was flying P-51s. Would I be interested? That decision took no time to consider. YES!

I had to resign my Reserve Commission and accept a Guard Commission to get back into P-51s. My little brother who had spent his Air Corps time in the Air Transport Command, joined as well. Peacetime flying in the P-51 was fine but it lacked the thrill of combat—no one to shoot at. I tried to teach my brother the nuances of "dog fighting" without killing him, but that became boring as well.

At the end of a year of this, I talked my wife into moving to Southern California where the competition in bowling was better. Thus it was, when Korea exploded and we were back in it. I wanted to go where I was needed! I contacted the 4th Air Force Headquarters at Hamilton Field to volunteer. They couldn't find my records. I drove around every part of California that housed a fighter group, looking for a spot. Finally, 4th Air Force told me they had located my records.

I was told, "You are in the Washington National Guard".

"No. I resigned that." I fought for months to be part of the action, with no luck. I went back to college and became a doctor of the oral cavity for the next 40 years.

Editor's Note: Wow! Did you get the feeling you just finished reading an inspirational essay on the power of prayer and positive thinking? Kelly was discharged from the USAAF in September 1945 with the rank of captain, returned to school and graduated from the University of Oregon as a dentist. He combined his successful 40-year dental practice with a 28-year career in the travel industry. Among his combat decorations are the Silver Star and the Distinguished Flying Cross with Oak Leaf Clusters. He was also elected President of the American Fighter Ace Association. Kelly currently resides with his charming wife, Ramona, in Vancouver, Washington.

Gathering of Mustangs and Legends

by Byron C. Solononides

The best of American aviation descended on Rickenbacker International Airport, just south of Columbus, Ohio during the week of September 27 through 30, 2007 to celebrate Air Force Heritage Week. This included the Gathering of Mustangs and Legends, paying tribute to one of the greatest fighter planes of World War II and the people that flew or built them. Over this four day period, more than 150,000 people came to see more than 75 operational P-51 Mustangs and more than 50 legendary pilots, crew chiefs, engineers and others associated with this airplane. Among those honored was Paul McCormick who served in NAA/LAD shop management on the P-51 production line.

The daily air shows provided a spectacular array of P-51s flying in various formations accompanied by F-15 and F-22 aircraft. The USAF Thunderbirds flight team also flew daily with an excellent demonstration of precision flying. In addition to the massive number of P-51s, the static display of World War II aircraft included the B-17 and RAF Lancaster bombers, T-6 trainer, C-47 transport, and P-47 and P-38 fighters. For contrast, the huge B-52 bomber and the C-17 transport also were on display along with the F-22. In addition, a B-2 Flying Wing put in a flyby appearance.

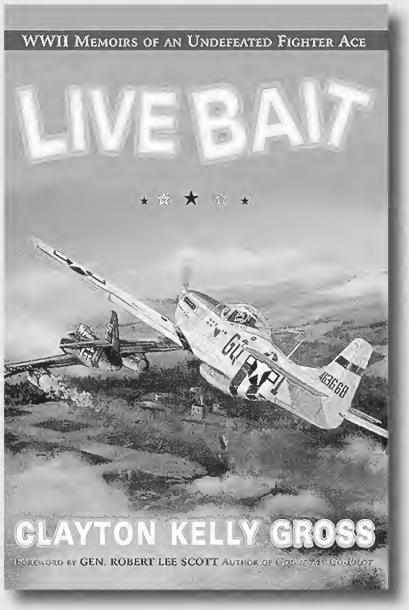


Paul McCormick, flanked by USAF Thunderbirds Team Members Major Nicole Malachowski, Right Wing, and Major Dan Mirski, Team Flight Surgeon, during a Gathering of Mustangs and Legends reception honoring the individual "Legends".

BOOK REVIEW

LIVE BAIT

by Clayton Kelly Gross



This is a story of a young man that came out of the Great Depression to achieve his boyhood dream of becoming a fighter pilot. He entered service as an Aviation Cadet in 1942, graduating from Kelly Field. He learned to fly in NAA airplanes, perfected his skills in NAA airplanes and went overseas to fight in NAA airplanes. He completed two tours of duty, flew 105 combat missions and became an Ace with the 354th Fighter Group, the first all P-51 fighter group.

He considers himself to be very lucky but he attributes his luck to his prayers. This is the kind of book you must read in one sitting because it reads like an adventure story and you are in the cockpit with "Kelly" on every mission.

Order from Amazon or from the author direct. Ask him to dedicate the copy to yourself or as a gift to another aviation buff.

Send a check for $29.95 + $4.50 shipping & handling = $34.45 to:

Dr. Clayton Kelly Gross
2306 SE Spyglass Dr.
Vancouver, WA 98683-5102

Fourth B-1 Reunion

Photos by Lee French

The Fourth B-1 Reunion was held on September 22, 2007 at the Golden Sails Hotel in Long Beach with more than 200 in attendance. It was a splendid mix of current employees working on the program and retirees from California, Nevada, Arizona, Oregon, Washington, Utah, Idaho, Missouri, Ohio, and Florida.

The speaker, Captain Scott "Disco" Higginbotham began flying the B-1 in 2000. He has four combat deployments, 58 combat sorties, 3 missions during Operation Anaconda, the 2005 General Curtis E. LeMay Combat Crew Award and many other awards and accomplishments. He is currently assigned the 31st Test and Evaluation Squadron at Edwards AFB. He is the only B-1 Pilot whose father also flew the B-1. He kept the audience captivated with his presentation and received a rousing response of appreciation at the conclusion of his talk.

It was another great effort by Lynn Isomoto, Karen Fraser and Lee French.



Lloyd Waggoner and Walt Sanders



Mary Lou Stanley, Madelen Bratzel, and Fred Castro



Dale and Peggy Stinson



Wally Haynes and Connie Geiser



Ed Rusinek, Don Safarik, and Lee French



Dorothy Nordman, Madeliene Phillips, and Jean Armour



Speaker Capt. Scott Higginbotham



Fourth B-1 Reunion
Golden Sails Hotel, Long Beach
September 22, 2007

United States Air Force
B-1B
LANCER

The Three Wise Men Appeared

by John Tribe

When the Florida NAA/Rockwell retirees met in December for their monthly luncheon in Cocoa Beach, they found three former Florida Vice Presidents/General Managers from the Apollo and Shuttle programs present. These three men led Florida Operations through some of the most difficult and important space events of our time.

Tom (TJ) O'Malley, 92, was the Atlas test conductor who launched John Glenn on his Mercury flight in 1962. He joined NAA in 1967 after the Apollo 1 fire. Tom was Director of Launch Operations through Apollo 11 and VP/GM for the remaining Apollo flights, Skylab, ASTP and the first Shuttle flight before retiring in 1981.

Al Martin, 83, joined NAA in 1951 and was a test conductor on the Navaho in Florida, returning to Downey in 1960 as the Director of S-II Test Operations. He came back to Florida in 1965 as Director of S-II Launch Operations. After Apollo, Al returned to Downey as Chief Engineer, Space Shuttle Integration and then as Chief Engineer, Orbiter. He again returned to Florida in 1982 and became Site Director and VP/GM for Launch Support Services, retiring in 1990.

Lee Solid, 71, started with NAA/Rocketdyne in 1959 and was assigned to Florida on the Atlas program in 1960. He served as Base Manager during the Mercury, Gemini and Apollo programs. In 1979, he became the Rocketdyne Site Director for Shuttle, Atlas and Delta programs. He replaced Al Martin as the VP/GM for Rockwell Florida Operations in 1990, retiring in 1998.



Congratulations and Best Wishes to

R. Max and Margaret Boyd of Las Vegas, Nevada
celebrating their 65th Wedding Anniversary

Virgil and June Crawford of Gold Hill, Oregon
celebrating their 59th Wedding Anniversary

Raymond and Jean Peterson of Los Angeles, California
celebrating their 58th Wedding Anniversary

Douglas and Daisy Alkire of Monterey Park, California
celebrating their 56th Wedding Anniversary

Pio and Frances Nieto of Fullerton, California
celebrating their 53rd Wedding Anniversary

Jack and Marie Ashby of Huntington Beach, California
celebrating their 50th Wedding Anniversary

Walter and Donna Thoennes of Murrieta, California
celebrating their 50th Wedding Anniversary

Contrails From The Past

by Ed Rusinek

Dear Ed,

We are making a concerted effort here at the Santa Maria Museum of Flight in Santa Maria, CA to establish an NAA section. We have a significant amount of NAA artifacts, reference material, pictures and models. I am a 30-year retiree from NAA and I am very excited about what we are accomplishing here. We have dedicated our area to John Henderson, NAA's F-86 field rep in Korea. We have a large amount of his files, many of Ed Horkey's papers and other information.

I took several photos of the area with John and myself to show the area as it stands currently. The museum is open Friday, Saturday and Sunday from 10:00 AM to 4:00 PM. However, we are here during the week and welcome anyone wanting to visit. The museum phone number is (805) 922-8758.

—Marvin Bailey, Nipomo, CA



Ed's Ans.: Well, God Bless you, Marv! You and John still have that NAA spirit to drive for excellence in whatever you do. It is only through individuals like you that the name North American Aviation remains alive and vibrant.

Dear Ed,

As I was thanking God this Christmas for all my blessings, I was especially thankful for my 40 years with NAA and RI. I received from it: a wife, friends, two college degrees, income, a pension, prescriptions and PRIDE! Thank God and thank you NAA.

—Richard Acton, Richmond, VA

Ed's Ans.: It is a rare person who rejoices over his good fortune and doesn't dwell on lost dreams. Dick, thank you for your renewal check and your great letter. Both were a lift up.

Dear Ed,

Although I am a Silver Eagle, I know you could always use a little more cash, even if only for coffee and donuts. I sincerely appreciate all your efforts toward publishing the Bulletin. I especially enjoy the articles associated with the Columbus Division where I was hired in May 1953 as an electrical tech on the FJ-2. I worked in EFT on the FJ-3, T2J, T-2B, A3J and the RA-5C. Great years! Still my favorite programs were the B-1 and GPS Launch Operations.

—John Andres, Seymour, TN

Ed's Ans.: Thank you, John, for your kind gesture. However, since we lost our office cubicle at Boeing, we have no place to meet and drink coffee. Thanks to the magnificent skills of our mini staff, we manage to publish the Retirees Bulletin from our homes. However, your donation will not be wasted. We are already making plans to establish a future North American Aviation Scholarship Fund to perpetuate the name North American Aviation long after we are gone. Your donation will be part of the seed money for this endeavor.

Dear Ed,

Please excuse my not using your renewal form but I always forward the Bulletin to my brother who is a retired Air Force pilot and former P-51 jockey.

—Don Larkin, St. Maries, ID

Ed's Ans. Never apologize when you are sending someone money! We thank you. Your brother should enjoy this issue!!

We Apologize to Peter Merlin!

In our rush to go to press with the Winter 2007 Issue, we assumed that the story *"The Battle of Palmdale"* was written by the person that sent it to us, Dr. Raymond Puffer, our guest historian. The story was actually written by another aerospace historian that is closely affiliated with Edwards Air Force Base, Peter Merlin. Upon learning of our error, we apologized to the author and he graciously accepted our "humble pie". Peter is a founding member of the X-Hunters Aerospace Archeology Team and has recovered aircraft artifacts from dozens of crash sites from the deserts around Edwards and Area 51. We are hopeful that he will favor us with some articles in the near future, this time assuring him of full credit as the author.

Dear Ed,

After Rockwell took over NAA, management instituted some drastic measures to "improve" the profit margin. I had a brilliant mechanical engineer working for me, Mark Killian by name. He had a superb personality and a great disposition. One day he informed me that he had a better chance for advancement in another department. I told him, "Take it, these opportunities do not come often."

In the interim, the Rockwell cost accountants dictated that expenses had to be curtailed. So they redistributed the floor space and all related normal facility expenses. With this action, they cleared out the entire 2nd floor of the huge main engineering building at LAD with the exception of the small group to which Mark was assigned.

Since it had been several months since I had been in that area, I decided to pay Mark a visit. On the 2nd floor, all the ceiling lights had been turned off except for the ones over his small group. It was bordered by a small three-foot high partition encircling the group. The desks were placed side-by-side in rows with about three feet between each row. To get to "your" desk you had to squeeze between the other person's chair and the desk behind, or walk over the top. It was one of the most dismal sights I had ever seen! Thousands of empty spaces going unused and these people crammed into a tiny space!

When I came over, I was wearing the normal attire of the day, a suit and tie. Mark was leaning over another engineer's desk and obviously discussing some technical issue. Being good friends, I yelled out from the shadows, "Mark! Why aren't you at your desk working?" I meant it as a joke; but, instantly, all 100+ engineers looked straight down at their desks and all voices went silent. Mark, without looking up, said, "Yes sir! Sorry." He then jumped on top of the desk he was at and skipped over to his own some five rows away and buried his head in a book.

This made things even worse than they were. You could hear a pin drop and, apparently all hearts were pounding with fear! I felt so very sad that the simple carelessness of my actions could make these great engineers feel so threatened of being fired, that I cried in anguish later for what I had done. This was the level to which Rockwell reduced the magnificent NAA technical staff!

As we all know, the ability of the company to engage in any major technical effort was basically exhausted within a few years and all of the company's greatness vanished.

—Cleve Kimmel, Billings, MT

Ed's Ans. Rockwell never built anything more complex than a truck axle before it took over NAA. Asking Rockwell to understand the complexity of the aerospace industry is like asking a pig farmer to perform brain surgery.

General Giap and the American Press

Much of the defeat of South Viet Nam can be attributed to the brilliant and ruthless skills of the North Vietnamese General Vo Nguyen Giap. A recent visit to Hanoi revealed his memoirs in the Vietnam War Memorial. These included the following quote:

"What we still do not understand is why you Americans stopped the bombing of Hanoi. You had us on the ropes. If you had pressed us a little harder, just for another day or two, we were ready to surrender! It was the same at the battles of Tet. You defeated us! We knew it, and we thought you knew it. But, we were elated to notice your media was definitely helping us. They were causing more disruption in America than we could in the battlefield. We were ready to surrender. You had won!"

General Giap's published memoirs confirm what most Americans already knew. The Vietnam War was not lost in Viet Nam—it was lost here in America. The same conditions exist today with regard to Iraq. With the whining politicians joined by a biased media constantly attempting to cut out the very heart and will of the American people, this Nation will again slip into a defeat. Only this time it will not involve the loss of one small country, but the loss of the entire free world.

Speeding Ticket!

Two British traffic patrol officers from North Berwick were involved in an unusual incident while checking for speeding motorists on the A-1 Great North Road. One of the officers used a hand-held radar device to check the speed of a vehicle approaching over the crest of a hill, and was surprised when the speed recorded was over 300 mph. The device then stopped working and the officers were not able to reset it.

The radar had, in fact, latched onto a NATO Tornado fighter jet over the North Sea which was engaged in a low-flying exercise over the Border district.

Back in police headquarters, the chief constable fired off a stiff complaint to the RAF Liaison Office.

The reply came back in true laconic RAF style: *"Thank you for your message, which allows us to complete the file on this incident. You may be interested to know that the tactical computer in the Tornado had automatically locked on to your 'hostile radar equipment' and sent a jamming signal back to it.*

Furthermore, the Sidewinder Air-to-Ground missiles aboard the fully armed aircraft had also locked onto the target. Fortunately, the Dutch pilot flying the Tornado responded to the missile status alert intelligently and was able to override the automatic protection system before a missile was launched."

The Silent Majority

by Stan Guzy

ARTHUR, DOROTHY W., 89 – passed away following an illness on November 29, 2007. She had been a winning athlete in track and field events, softball and volleyball in her hometown of Chicago, IL. She moved to Buena Park, CA with her family in 1956 and went to work at Autonetics as an inspector and lead person for 30 years before her retirement.

BAUDER, BAIRD T., 89 – of Irvine, CA died on November 6, 2007 of undisclosed causes. He had served as an engineer at NAA/RI.

BEAVERS, WILLIAM "BILL", 76 – a resident of Corona, CA, passed away on December 6, 2007. He was an electronics engineer with 41 years of service when he retired from NAA/RI.

BONINI, DOROTHY A., 80 – of San Juan, Capistrano, CA died December 31, 2007 of undisclosed causes. She had been an employee of NAA/RI for 28 years.

BROWN, RICHARD W., – died on January 29, 2008 at the St. Rose Dominican Hospital in Henderson, Nevada. He was the Manager of Material Preparation and Kitting at the time of his retirement from Space Division. He served with distinction through many of the major space programs. He was respected for his caring management style and his never-ending support of his team. Richard is survived by his loving wife Esther.

BUCK, EARL A., – passed away on November 2, 2007 from lung cancer in Medford, OR. Earl worked at the Space Division on the Apollo Project in the Quality Control section. He retired in 1995 and is survived by his wife Shirley who is also an NAA/RI retiree.

CASSIDY, PETER M., 71 – died of cancer on October 28, 2007 in Rancho Cordova, CA. Peter's family lived just outside of Hickam Field and Pearl Harbor on December 7, 1941. Peter retired from Rockwell after 35 years of service as a field rep. He is survived by his wife of 45 years, Betty.

DAHM, WERNER K., 90 – of Huntsville, AL passed away on January 17, 2008. He was the last of the original team of German rocket scientists to retire from NASA at 89. Werner served as chief of the Aerophysics Division at the Marshall Space Flight Center and later as chief aerodynamicist. His work as a rocket pioneer provided a valuable contribution to this nation's ballistic missile programs and manned space flight.

DE BARRO, HENRY J., 86 – of Marina Del Rey, CA succumbed to a long and painful illness on December 10, 2007. He was an accomplished engineer and participated in such programs as the Concorde, the Space Shuttle, and the B-1B prior to his retirement at the age of 80. He is survived by his devoted wife Erna.

FARRELL, LAURA R., 88 – died on July 12, 2007 in Hesperia, CA. Laura served as a labor relations representative at North American/Rockwell. She was a member of the Hesperia Art Club and the Leisure League.

FLOWERS, EMMA "LUCILLE", 88 – of Quail Valley and Canyon Lake, CA died in Murrieta, CA on January 15, 2008 of congestive heart failure. Lucille retired from Space Division in 1972 to care for her ailing husband, Neely. She provided loving care for the next 13 years until his death in 1985. She is survived by her daughter Sonnie K. Robertson, son-in-law Lou Tiberio, and sister G. Maxine Preston, all three retirees of NAA/RI.

FUNKE, FRANK E., JR., 84 – passed away on November 14, 2007. His career included stints with other companies before he joined NAR/RI. He worked on the Minuteman, Apollo projects, and his favorite, the B-1 Bomber. During this period he also managed to earn a MBA in Electrical Engineering from USC.

GASPER, RICHARD "PARKER", SR., 80 – passed away in 2007 from complications related to diabetes. In 1952, with a degree in Mechanical Engineering, he went to work at NAA and then transferred to Autonetics where he had a distinguished career.

GEHRING, RICHARD W. "DICK", 80 – of Upper Arlington, OH died on December 3, 2007. A graduate of Tri-State University in Angola, IN, Dick served at the Columbus Division for 35 years, retiring in 1990. During his career, he authored and presented numerous papers related to aerospace structural research. He is survived by his loving wife of 59 years, Ellen.

GRAVES, WILLIAM E. "TED", 86 – passed away on December 1, 2007 of complications related to surgery for an intestinal blockage. Ted joined NAA in 1946 as an engineer in the Flutter Group at LAD until his retirement in 1983 after 37 years of service. He worked on the X-15, B-70, and Space Shuttle programs and during that period he also earned an MBA from USC. Ted is survived by his wife of 60 years, Marcia.

HALILLIE, GEORGE, 78 – died on November 9, 2007 of kidney failure, two months before his 79th birthday. George joined NAA at LAD in 1955. While in Circuit Design engineering, he worked on the B-70, the X-15, C-17, B-1, and Apollo programs, and, on loan to Boeing, on the 757 program in 1979. George retired from NAA/RI in 1990.

HUNLEY, LAMAR C. "MARK", 80 – of Bexley, OH died on November 27, 2007. Mark joined NAA at the Columbus Division after graduating from Ohio State University and later retired in 1985. He is survived by his wife of 56 years, Nancy.

HUNT, RICHARD J., 73 – passed away on November 15, 2007 from undisclosed causes. With a BS in Engineering he spent 30 years in the aerospace industry before retiring from NAA/RI/Boeing. His beloved wife Deanna survives him.

JEPSON, ARTHUR C., 87 – passed away on May 3, 2007 in Laguna Beach, CA. He joined LAD as an Environmental Control Systems engineer and retired from the ECS group in Downey in 1981 after 32 years of service.

LARSON, W. HAL, – the Fall Issue of the Bulletin returned marked "Deceased". No further information available.

LINDSDAY, THOMAS H. "TOM", 73 – died on February 4, 2008 in Colorado Springs, CO from complications following emergency surgery. Tom was manager of Space Shuttle Logistics Engineering when he retired in 1989 after 30 years of service. He is survived by his wife of 51 years, Jan.

MARTIN, ENID P., 86 – passed away peacefully on August 13, 2007. Enid was the 1939 Rocky Mountain Region's Typing and Stenography Champion. She was the Executive Secretary to the President of the NAA Autonetics Division. She retired in 1983 after 33 years of service. Enid's husband Norman preceded her in death.

McWILLIAMS, DONALD R., 82 – former resident of Placentia, CA died on January 10, 2008 in Athens, Georgia from undisclosed causes. He retired from NAA/RI Autonetics Marine Group in 1989 after 35 years of service.

NORDSTEN, RALPH W., 90 – died of congestive heart failure in Westchester, CA on February 18, 2008. Ralph retired as supervisor on the Sabreliner flight line in 1978 after 32 years of service. He is survived by his loving wife Florence.

PINKERTON, DALE K., 73 – passed away on December 24, 2007 in Riverside, CA. Dale served as an engineer at Autonetics for over 30 years before retiring in 1991. Burial was at the Riverside National Cemetery. He was preceded in death by his wife, Bette.

ROBERTSON, JAMES A. "ROBBIE", 81 – passed away in Culver City, CA on December 25, 2007 from complications of a long illness. Robbie joined NAA/LAD in the Tool and Die Department in 1946 and retired in 1976 as a senior design engineer in Armaments. An accomplished entomologist, he was known around the facility as the "bug man". In this capacity, he was affiliated with the LA Museum of Natural History and the Smithsonian Institution. He is survived by his loving wife of 61 years, Donna.

ROSSI, NORM, 83 – passed away from undisclosed causes in Minden, NV in March 2007. He retired from LAD after serving many years in the B-1 Purchasing Department. His loving wife of 63 years, Myra survives him.

SAUNDERS, ROMAINE "SANDY", JR., 87 – died peacefully in Riverside, CA on November 17, 2007. Sandy served at Rockwell for 26 years as an electronics engineer. He is survived by his wife of 62 years, Roberta.

SCHULZ, HERB – of Torrance, CA, passed away on July 8, 2007. Herb retired from the Experimental Department in 1959 after 18 years of service. He is survived by his wife Mildred.

SUGAMURA, TOM M., 78 – of Los Angeles, CA passed away on September 29, 2007 after a long and heroic battle with thyroid cancer. Tom retired from the Los Angeles Division in1990 after 37 years of service as an electrical engineer. He enjoyed his retirement playing golf and meeting with other retirees for breakfast periodically in Long Beach. He is survived by his loving wife Terry.

SWEET, HARRY E., 87 – passed away in Granada Hills, CA after a brief illness on July 3, 2007. Harry retired from LAD in 1978 after 28 years of service as an engineer on the Crew Escape Systems.

TERRY, PAUL A., 81 – of Hemet, CA passed away on December 26, 2007. Paul served in the Army in WWII and retired from NAA/RI in 1986 after many years of service. He is survived by his longtime companion Nita Dona.

THRESH, JAMES L., 87 – passed away on November 14, 2006 at his home in Long Beach, CA. Jim's career spanned 34 years with NAA/RI beginning in 1941 at LAD. He worked in various locations in Southern California and for 12 years was the manager of Quality/Reliability Assurance at the Autonetics Navigation Systems Division. Prior to his retirement in 1975 he was the Corporate Manager for Quality Assurance Western Region.

TRIAY, ALLEN C., 90 – passed away on December 8, 2007 of natural causes. Allen was employed at the Autonetics Division for 20 years. He worked on a variety of projects including the Minuteman missile and NASA space programs. Allen is survived by his wife of 60 years Paulette.

TUMA, CHARLES A., 96 – of Anaheim, CA passed away on November 14, 2007 from undisclosed causes. Chuck worked at NAA/RI until his retirement. He was inducted into the Orange County Bowling Hall of Fame in 1991, a most happy moment for him. He is survived by his wife Marian.

WINCHESTER, W. C. "CLYDE", – of Long Beach, CA died of a sudden heart attack on June 5, 2007. Clyde worked in the Fuel Systems group on the B-70 and B-1 prior to his retirement in 1986 after 37 years of service. His wife Shirley survives him.

WOLFENSTEIN, BARTLEY "BOB", 78 – of Buena Park, CA passed away on November 27, 2007. Bob served in Downey in Reliability Engineering for 38 years before retiring in 1985. Bob was very severely wounded during the Korean War but he never let his injuries detract him from a full life. He was a good friend. He is survived by his loving wife Blancha.

LOST SHEEP, BULLETIN RETURNED, NO FORWARDING ADDRESS

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North American Aviation Retirees Bulletin

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Photo from the Ben Boykin Collection

A WS-131B Hound Dog, released from a B-52F over the White Sands Missile Range, performs a High-Low Altitude Profile mission using the physical features of the terrain to avoid radar detection.

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION Retirees Bulletin

Summer 2008

Inside:

THE MINUTEMAN AIR DROP by Gene Andreosky
REQUIEM FOR A HEAVYWEIGHT: LAST FLIGHT OF THE X-15 by Peter Merlin
APOLLO-SOYUZ – THE LAST APOLLO MISSION by John Tribe
AN NAA TECH REP'S DATE WITH HISTORY by Larry Hickey and Scott Miller

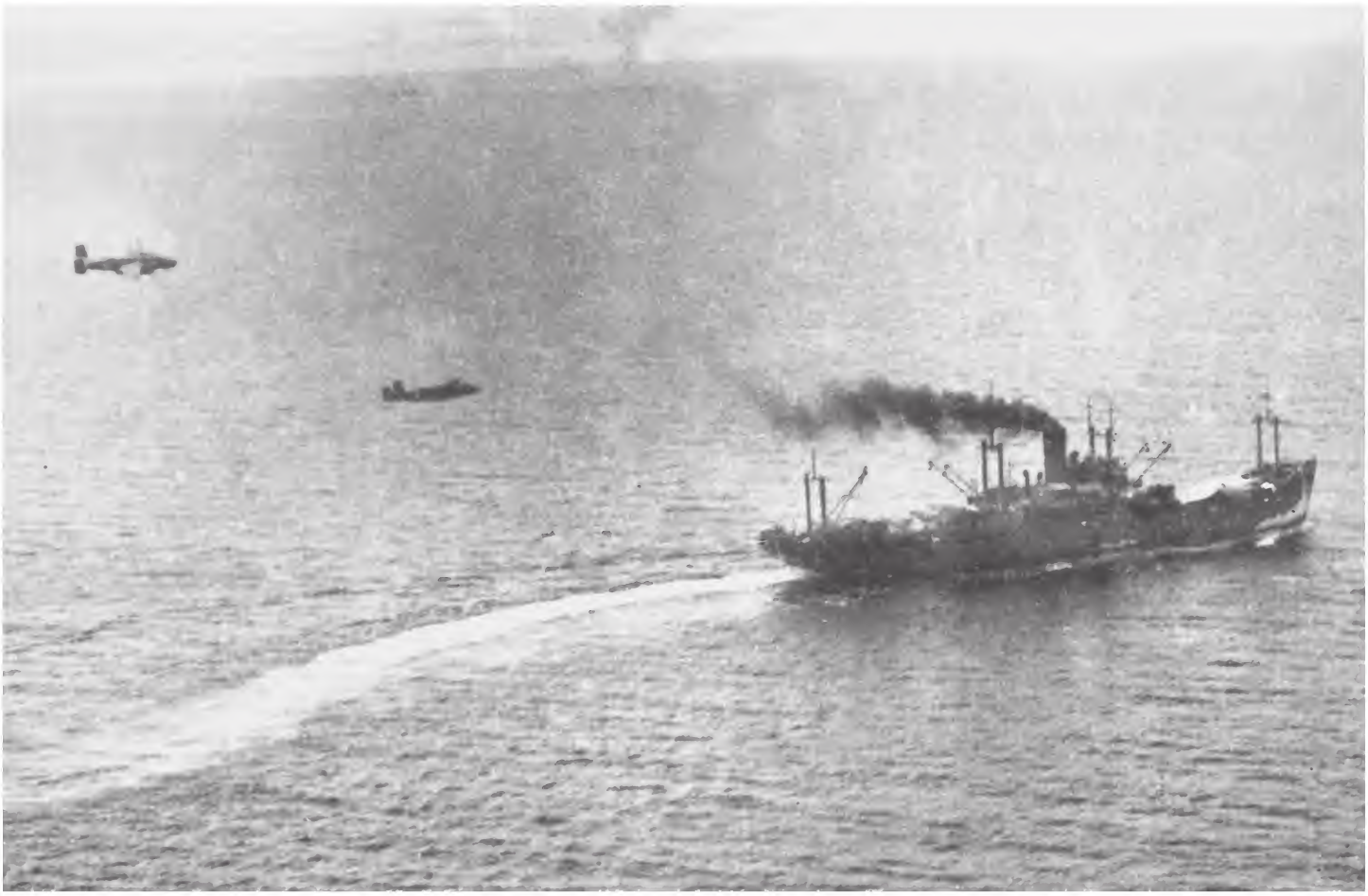


Photo from the Lawrence Hickey Collection

In early March 1943, the Japanese Imperial Navy sent a convoy of sixteen ships from Rabaul to Lae to reinforce the Japanese Army garrison engaged in a desperate battle for New Guinea. Under the command of Admiral Kimura, known as the* "Eel of the Pacific" *for his lightning-like movements, the convoy was only a few hours away from Lae when the B-25s from the 90th Bomb Squadron, 3rd Bomb Group struck! Using a new tactic of strafing and skipbombing developed by USAAF Col. "Pappy" Gunn and NAA Field Rep Jack Fox, the B-25s sank all eight transports and four of the escorting destroyers over a two day period in what became known as the Battle of the Bismarck Sea.

NORTH AMERICAN AVIATION
Retirees Bulletin

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Dear NAA Retiree Bulletin Subscriber

We have received an unusual amount of compliments regarding our Spring 2008 Issue. This was followed by many subscription renewals and gift subscriptions to friends and colleagues that were not even aware that the NAA Retirees Bulletin existed. We thank all of you for your continuous support and encouragement.

The 46th Annual Reunion of the Bald Eagles was held on April 12th at the Proud Bird Restaurant. Although we saw many familiar faces, the turnout included less than 250 retirees. That is unfortunate because the speaker, Shep Hill, the President of Boeing International, gave an outstanding and chilling report of America's future ability to compete against the two growing powerhouses: China and India. We are losing in the battle to educate our young people to match the honor students of these two countries much less to surpass them. The number of honor students being trained in these two major nations exceeds the total number of students in the United States. Unless there is a dramatic redirection in American education, America may descend into a Third World nation from which it will be extremely difficult to recover.

In this vein, we should consider the development of an academic scientific elite similar to the Army at West Point, the Navy at Annapolis and the Air Force at Colorado Springs. Even that will not be enough. These are factors which every American should consider as he enters the voting booth this November.

Once again, we present an outstanding team of authors with some amazing accounts of the people, designs and events that bore the cachet of North American Aviation. Even in failure—and we had a few of those—North American Aviation always demonstrated a certain panache that represented the very best in thought and deed! From Autonetics, we have Gene Andreosky describe a launch of a Minuteman missile while suspended by parachute. From KSC, we present John Tribe with a gasping account of the Apollo-Soyuz mission. From NASA at Edwards AFB, we have historian/archivist Peter Merlin place us in the cockpit of the X-15 during its final flight. Finally, we have a story about NAA Tech Rep Jack Fox and his field conversions of the B-25 into fighter-bombers. The authors are Lawrence "Larry" Hickey and Scott Miller. Larry is the founder of International Historical Research Associates, which has almost forty "Associates" in 13 countries conducting research into World War II aviation history. Is this great or what?



Photo from the Lawrence J. Hickey Collection

NAA Tech Rep Jack Fox in June 1942, a few months after he arrived in Australia to assist the Dutch with the first B-25s off the production line to reach the Southwest Pacific Theater. The airplanes and Jack Fox were quickly transferred to the USAAF 3rd Bomb Group where he became a part of a legend.

The Minuteman Air Drop

by Gene Andreosky

On Friday, August 24, 1974, I was told by the Autonetics Minuteman program manager to attend a meeting that afternoon at the Space and Missile Systems Organization (SAMSO) located at Norton Air Force Base in San Bernardino, California. Autonetics was the guidance and control contractor for the Minuteman missile. The program manager did not know the subject of the meeting but the company was told to send a representative, preferably someone with a control systems background. When I got to the meeting I noticed the room was filled with an assortment of people, both military and civilian. Some of them I knew from past programs but a large number were faces I had never seen before. One unusual thing was that Brigadier General John Hepfer, Commander of SAMSO, was in attendance.

The attendees were told that we were going to do something that had never been done before called the Air Mobile Feasibility Demonstration. We were going to drop a Minuteman-I missile from a Lockheed C-5 airplane and ignite it in the air. The missile was to be placed on a pallet in the airplane, dropped out of the airplane with the pallet tethered to the airplane. The missile would then slide off the pallet and parachutes would open for a controlled descent. As it approached the water, the missile would be released from the parachutes and a modified stage one motor that had ten seconds of active propellant (the rest being inert) would ignite. Thiokol would make the modification. Stages two and three were to be inert propellant motors that had been around for years.

And, oh yes, the whole thing was to be completed by November 1st, slightly more than sixty days away. If not completed by that day the project would be terminated.

The first thing that came to my mind was that it could not be done because the Minuteman-I guidance platform did not have sufficient gimbals freedom to perform the task. SAMSO had a solution to this problem.

A little sidebar will help here. When Minuteman-I was upgraded to Minuteman-II and, subsequently, to Minuteman-III, the stage two and stage three rocket motors were replaced and the old motors dispositioned as surplus. An enterprising company in Chatsworth, California—Space Vector Corporation—purchased these surplus motors, placed an attitude control guidance system on top, and sold the system called Aries with various atmospheric sensors as payload. They were reasonably successful with this and sold them around the world as sounding rockets. It was this guidance system that we were going to use in place of the Minuteman system.

I was given the task of integrating the Space Vector system with the Stage One P89 Nozzle Control Unit (NCU) and making sure that the system was stable. I arranged for a meeting to be held the following Monday at Space Vector in Chatsworth. I wasn't particularly looking forward to the meeting because at that time I lived in Laguna Hills, which is in the southern end of Orange County and Chatsworth is in the western end of the San Fernando Valley. It was only about 80 miles but Los Angeles was in between.

The next day, Saturday, I was at home doing my normal Saturday tasks. While mowing my lawn, I received a telephone call from the Autonetics patrolman who was in the company



U.S. Air Force photo

A Minuteman-I missile is extracted from a Lockheed C-5A during the Air Mobile Feasibility Demonstration.

control center asking if he could give my home phone number to Newell Saunders who was our logistics department representative at Hill Air Force Base in Utah. I told him he could and, shortly later, Newell called. He said if I needed any hardware at all to give him a call. I told him that all I would probably need was a P89 NCU and to assure that all the rocket motors, both live and inert, had working raceway cables so we could communicate between the guidance set and the NCU. I resumed my lawn mowing when I received another call from the patrolman asking if he could give my number to a civil servant from Hill Air Force Base. This person was the top civil servant for Minuteman maintenance at the base. He also assured me that if I needed anything to give him a call and he would see that I would get it. Later in the morning, I received a third call. At this point, the patrolman said something important must be going on. This time it was the bird colonel in charge of Minuteman maintenance assuring me that if I needed anything I was to just give him a call. He gave me his office phone number and said his secretary was to interrupt any meeting to take the call.

When I arrived at the meeting Monday morning, the Space Vector conference room was completely filled. I was the lone Autonetics representative, the SAMSO guidance office assigned a representative, I believe his name was Capt. Bowen, Space Vector had some people, but the vast majority were from TRW. As I started to review the assignment we had, I was immediately bombarded with all sorts of questions from the TRW people, "How are we going to assure this?... etc., etc." all sorts of things. I called time out and asked Capt. Bowen to meet me outside the room. I told him if we were to meet our schedule, I could not possibly answer all those questions. To his credit, he told TRW to name one representative and the rest were to leave the room. We then continued the meeting.

Space Vector was a small company but it had an enthusiastic work force. The person who was the driver for the company was a consultant named Joe Jerger. He was as obnoxious as could be but he was brilliant. He later became president of the company. Joe and I got along great. We set up our working arrangement. The president of Space Vector, to his credit, gave me complete authority to commit his company to anything I deemed necessary.

I had a very good Autonetics control engineer, Leo Hayes, working with me. He set up a simulation in the Autonetics analog simulation laboratory that proved very valuable. We

simulated the missile as it dropped on the parachutes and after ignition. After ignition, the plan was to position the missile to fly straight up, maintain constant attitude for the ten seconds and, when it reached its apogee, drop into the ocean.

Another little sidebar will help here. All missiles have bending modes. Normally, one does not see them in flight on telemetry because they are washed out when the motors are pressurized. The only people who worry about them are the controls types because if not taken into account they can destroy the missile. On Minuteman, the first bending mode is at around six Hertz. The second is at around thirteen Hertz. The first mode was very prevalent in the simulation. This will become very important as one will see later on.

In order to have freedom of movement, the program was unclassified but we were told to treat it as secret as far as discussing it with others outside the working group. About three weeks into the program we received word that there was a leak. "Somehow", the New York Times and the Washington Post found out that something related to Minuteman and the C-5 was taking place. Sure enough, it was in their papers.

While we on the missile side were working our problems, the airplane people were working theirs. Their major problem was the total weight of the missile and pallet. Combined they were three times heavier than anything that had been dropped from an airplane before. They were continuously breaking tethers with all sorts of multiple combinations as they dropped simulated loads.

On the last Saturday in September, SAMSO decided to conduct a sample drop using an old "iron bird" missile at the Department of Defense National Parachute Facility in El Centro, California. If you were not aware that there is a DoD National Parachute Facility that's okay because neither was I. Lockheed, the C-5 contractor, was panicking. They were the first under the gun. Several days before the test they were still breaking tethers. Desperately, they decided to go with a single tether of approximately six inches in diameter. With few days to spare, they put in a hurried call to, I believe, Goodyear. I was told that Goodyear designed, fabricated and shipped the new tether in ONE DAY.

El Centro in September is not exactly the most desirable place to visit. It was hot and smelly! All participants went down on Friday. TRW personnel and senior SAMSO personnel, having a head start, booked their rooms at the El Centro Country Club, taking up all the rooms. Capt. Bowen asked if I could book him a room through our travel department hoping to get a reduced rate. The motel owner of the place we stayed at did not give him a reduced rate but gave him the best room in the motel. The cost of each of the rooms for both Capt. Bowen and myself was eight dollars.

SAMSO was not too subtle about the test. The C-5 was flown into the El Centro Naval Air Station a day ahead of time. It was by far the largest aircraft ever flown into that facility. Also, the test was to be held on a Saturday. It was the first Saturday that facility worked since World War II. The Soviets couldn't use trawlers to observe the test but several campers were observed parked in spots where campers normally did not park.

The test went without a hitch. The pallet went out of the plane, the tether held and the parachutes deployed. The dummy missile landed in the desert. Everyone went home after the test except Joe Jerger and me. We stayed behind to look at the telemetry data. It is a good thing we did. The first bending mode was very prevalent. Also, the missile as it was coming down on the parachutes was oscillating like a pendulum about the roll axis. The scheme we had planned earlier would not work. We decided the first thing we should do upon ignition was bring the missile rates to zero and then the attitudes. I called Leo Hayes and asked him to meet me at the simulation lab the next morning. We inserted the proposed fix and tested it out. It worked fine. I called Space Vector and told them what changes to implement.

Monday morning TRW and SAMSO personnel got to see the telemetry data and they panicked. The phone started ringing off the hook. I told them to calm down. The six-cycle oscillation they were seeing was the first bending mode and it was nothing to worry about. Regarding the pendulum oscillation about the roll axis, I told them we already had the fix implemented.

At the onset of the program some ground rules were established. There would be no formal design reviews, rather there would be a series of continual technical interchange meetings. I was continually on the road. Most times I was representing both Autonetics and Space Vector. One night while I was at home, I received a call from Capt. Bowen. He was at Hill Air Force Base where the missile that was to be dropped was being assembled. He wasn't sure if the guidance commands were moving the nozzles in the proper direction. I tried to explain it over the phone but he asked if I would come up to make sure everything was done right. I went to the Orange County airport and was able to get on the last plane to Salt Lake City. I got into Salt Lake City, rented a car and got to Hill Air Force Base about midnight. I had been to the base many times but never in the maintenance area where the missile was being assembled. Capt. Bowen had given me the building number but I had no idea where to start looking. Fortunately, they had put a person outside the correct building with a flashlight so I found my way in. We conducted the tests and I assured them that things were working properly. I didn't bother to get a hotel room. I caught the first flight out to Orange County in the morning and went to work.

Finally the time came to think about the real drop. SAMSO decided to make a test run. The plane took off from Edwards Air Force Base and made the run to Vandenberg Air Force Base. We tested the telemetry to make sure every thing worked. The day was beautiful, hardly a cloud in the sky. The plane then returned to Edwards.

October 24th was picked as the date of the real drop. Again, in subtlety, the Coast Guard closed the whole channel between the mainland and the Channel Islands to shipping. This is rarely done. However, there were some trawlers off the coast. Unfortunately, the day was uncommon for an October day. It was more like June. A thick overcast settled in. A decision was made to go ahead anyway. I was in the control center as the plane approached. I had to give the go that the guidance and control was working properly. Every thing worked beautifully. Unfortunately, no one could see it.

Again, most people took off when the test was completed. I decided to stick around to see what the films showed. The films showed the plane coming over and dropping the pallet with the missile and the parachutes deploying. The films also showed the missile coming up through the cloud cover after ignition. Most of us were in our work clothes. In the back of



U.S. Air Force photo

The airdropped Minuteman test missile begins to align into a vertical attitude before igniting its stage one motor.

the room was a gentleman whom we had never seen before. He was dressed in a suit. We later found out he was from the State Department and he was there to get a copy of the films. He had a plane waiting and took off immediately for Moscow where Henry Kissinger was meeting with the Soviets.

We met our deadline with a week to spare. The cost to the government for all parties, both missile and aircraft, was $7 million. The Autonetics cost was about $33,000. The only people working it from our company were myself, Leo Hayes and Chris Myers from the program office.

When it was over, a little party was held at SAMSO. General Hepfer said we would probably never see another program like it again. He was right. After a while citations were issued. General Hepfer presented Mort Margolis a citation for the Autonetics contribution to the task. The citation specifically noted the rapid turnaround in the fix of the control scheme after the first inert missile drop. He also presented me with an Air Force Systems Command Certificate of Merit. The commendation states that the Air Mobile Feasibility Demonstration was one of the most remarkable peacetime achievements in this Nation's military technology. Some years later, I attended a function commemorating SAMSO's twenty-fifth year of existence. I was shocked when the Secretary of the Air Force said that of all of SAMSO's accomplishments, the one he thought was the single most important was the Air Mobile Feasibility Demonstration. He said it worried the Soviets so much to think that the United States could develop an air mobile Minuteman force that they (the Soviets) became much more cooperative in negotiations.

About the Author: Gene joined the newly formed Autonetics Division of NAA in July 1957. His first assignment was the flight control system for the A3J. He was one of the first to move to Fullerton and then to Anaheim. After Autonetics won the competition as contractor for the Minuteman Guidance and Control System, Gene was instrumental in the design and development of the system. He held several management positions and was the program manager for the Autonetics portion of a large corporate covert program when he retired in 1990. He currently resides in Santa Ana, California with his charming wife, Judy.

Congratulations and Best Wishes to

Larry and Kathryn Larsen of Chester, California
celebrating their 70th Wedding Anniversary

Gerald and Esther Funk of Paonia, Colorado
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celebrating their 50th Wedding Anniversary

My basic principle is that you don't make decisions because they are easy; you don't make them because they are cheap; you don't make them because they are popular; you make them because they are right.

—Theodore Hesburgh

Requiem for a Heavyweight: Last Flight of the X-15

by Peter W. Merlin

On the morning of 24 October 1968, a silver, eight-engine NB-52A jet bomber made a graceful turn in the skies above Edwards Creek Valley, Nevada. Slung beneath its wing, a black, stiletto-shaped vehicle waited to be set free. As Lt. Col. Emil "Ted" Sturmthal and Sqn. Ldr. John Miller (a British Royal Air Force exchange pilot) guided the modified Stratofortress south toward Smith Ranch, Jack Russell worked with intense concentration at the launch panel. William H. "Bill" Dana, pressure-suited and strapped into the black X-15, completed his cockpit checklist.

It was business as usual, a "routine" flight, inasmuch as any X-15 mission was ever routine. The vehicle, "airplane" is scarcely an adequate word for it, was essentially a propellant tank with stubby wings and tail fins, engine, and cockpit. A 1,000-gallon tank of liquid oxygen (LOX) was located directly behind the pilot. A 1,400-gallon tank of extremely volatile anhydrous ammonia sat directly behind the LOX tank. Hydrogen peroxide tanks supplied the reaction control system (RCS) rockets on the nose and wingtips. Tanks of helium gas pressurized the propellant systems that fed a 50,000-lb. thrust rocket engine.

The pilot sat in the "front office," a cramped cockpit filled with a dizzying array of instruments and switches. He typically spent the first part of his preflight preparations donning his pressure suit. This ordeal was a team effort akin to a medieval knight putting on a suit of armor. In a sense, this is exactly what the pressure suit was: armor to protect the X-15 pilot from the hostile environment at the edge of space. First technicians attached a host of biomedical sensors to the pilot's body to measure vital signs. Next, the pilot squeezed himself into a rubbery, tight-fitting garment with numerous hoses, fittings, and a metal neck ring. Having zipped the inner garment shut, technicians assisted the pilot into a baggy, silver outer pressure suit, boots, gloves, and finally a helmet. A lengthy checkout procedure verified that all suit components were functioning, and that there were no leaks.

Bill Dana was familiar with the suit up procedure. He had made 15 previous flights in the X-15, attaining a maximum speed of Mach 5.53 and a maximum altitude of 306,900 feet. The latter had earned him his astronaut qualification, and was the last X-15 flight to exceed 300,000 feet. His 16th flight (the 199th flight of the X-15 program) was to be his last, and was scheduled as second to last mission for the aircraft. The program managers wanted to end with an even 200 flights.

Four minutes prior to launch, Lt. Col. Sturmthal leveled the wings of the NB-52A mothership at an altitude of about 45,000 feet. Artwork on the bomber's side identified the plane as *"The High And Mighty One,"* with a painting of an eagle launching the X-15. Gary Krier, flying chase 10,000 feet below, pushed the throttle of his F-104 forward and climbed to join the bomber.

One minute prior to launch, the aircraft passed abeam of Edwards Creek Valley dry lake, with Smith's Ranch slightly ahead on the right. Dana completed his prelaunch checklist: Prime switch to PRIME. Igniter ready light ON. Precool switch to PRECOOL. Igniter idle switch ON.

"Looks good here, Pete."



Photo from the Peter Merlin Collection

Test Pilot and Astronaut Bill Dana made the 199th and last flight of the X-15 program.

Maj. William J. "Pete" Knight responded from the control room, "Looks good here, Bill."

Launch switch to LAUNCH. The X-15 dropped away from the B-52, and Dana ignited the engine. The black dart quickly outdistanced the mothership, and even Krier's supersonic fighter. Trailing a white plume, Dana was soon passing through 80,000 feet.

The engine's mighty thrust pushed Dana back in his seat. His workload increased as he struggled to maintain his desired heading, and prepared to activate various experiments. Nearly 84 seconds after launch, the X-15 attained a maximum velocity of Mach 5.38 at 148,000 feet altitude, and continued to climb after engine shutdown.

The X-15 launch had been coordinated to coincide with a missile launch from the Western Test Range (WTR) at Vandenberg AFB on the California coast. At 235,000 feet, Dana extended the WTR Launch Monitor Experiment and called out, "It's up, Pete, and I saw the missile." Less than three seconds later, the experiment package unexpectedly lost power and retracted.

As the X-15 reached 255,000 feet, it described a ballistic arc and began the downhill slide toward Edwards AFB, California. Other onboard experiments did not require the pilot's attention. Valuable data were obtained from a Fluidic Probe Experiment and a Fixed-Sphere Direction Sensor on the nose. Unfortunately, a High-Altitude Sky Brightness experiment failed due to a blown fuse. The vehicle crossed over Death Valley and, as the pilot's workload decreased, Dana had time for a little sightseeing. Over the China Lake Naval Weapons Center, he began preparations for entering the traffic pattern at Edwards. Descending through 75,000 feet, the X-15 slowed to Mach 3.2 and Dana finally caught a glimpse of his landing site on Rogers Dry Lake.

The rocket plane made a steep approach as chase planes raced to join it for the landing sequence. As Dana entered the pattern, he had time to banter with Maj. Knight. "And we got you coming downwind. Looks real good, Bill," Knight commented.

"Looks real good to me," Dana replied. "That's the one I was worried about," said Knight, wryly. "The downwind?" asked Dana. Knight shot back, "No. Looking good to you."



Photo from the Peter Merlin Collection

The X-15 climbs to the edge of space after release from the B-52 Mothership.

The black plane, now just a stub-winged glider, touched down on the hard-packed clay surface of the lakebed, raising a plume of dust. Two silver F-104 chase planes followed it to the ground then climbed away as the X-15 continued its long slide across the playa.

Bill Dana celebrated his final X-15 flight, but the to the program engineers it was still business as usual. Data from Flight 199 were collected and reduced. Plans were made for Flight 200, which was to be the final flight of the program. Maj. Knight was selected to fly the mission, which included a variety of experiments.

It was initially scheduled for 21 November 1968 as a Smith Ranch launch. During engine runs a few days before launch, technicians discovered a few small discrepancies that resulted in a delay of about a week. The X-15 was mated to the second mothership, the NB-52B, on 25 November, but electrical problems and leaks in the liquid nitrogen and helium systems pushed the mission back a few more days.

Following pilot entry on 27 November, a hydrogen peroxide leak was discovered. The leak apparently stopped, but the flight was cancelled due to another mechanical malfunction. Since the NB-52B was scheduled for maintenance, the X-15 was de-mated. The NB-52A *"The High And Mighty One"* was unavailable because it was supporting the HL-10 lifting body program, so the X-15 flight slipped to 10 December.

On 9 December the X-15 was mated to the wing of the NB-52A, but poor weather and an inertial guidance system malfunction resulted in cancellations over the next seven days. On 17 December, the weather was within limits, but the flight was cancelled due to lack of a C-130 support aircraft from the Air Force. The following day, inclement weather again plagued the launch lake. Flight planners changed the mission profile to begin with a launch from Hidden Hills, west of Las Vegas, Nevada. This meant flying a shorter distance and lower altitude, sacrificing some of the science experiments.

On 20 December, poor weather closed in again. Flight planners discussed launching the X-15 over Rosamond. This short hop would preclude obtaining any scientific data. As a rare desert snowstorm moved in on Edwards, Bill Dana prepared to make a weather reconnaissance flight in a Lockheed F-104. Rolling down the taxiway, Dana's aircraft vanished into a white wall of snow that obscured even the nearest hangars. John Manke called him on the radio to advise him to return. There would be no 200th X-15 flight.

Following this final attempt, the ground crew sadly demated the X-15 from the NB-52A, and prepared it for indefinite storage. After work, the program personnel descended on Juanita's saloon in Rosamond for a formal wake. And so, the program ended not with a bang, but with a whimper.

It did not, however, fade into obscurity. Perhaps the most successful research aircraft program in U.S. history, the X-15 left a legacy of scientific data and aeronautical firsts that remains unparalleled. Over a nearly 10-year period, 12 pilots flew three X-15 research vehicles 199 times. The program contributed to numerous advances in aerospace technology, including materials, hypersonic aerodynamics, astronomy, and spaceflight. The X-15 even served as a testbed for insulating materials and celestial navigation equipment for the Apollo lunar exploration program, and contributed to development of the Space Shuttle. The program generated more than 760 technical reports, and earned numerous awards and honors for the X-15 team.

The original X-15 made both the first flight, on 8 June 1959, and the final flight. It now resides in the National Air & Space Museum in Washington D.C. The number two aircraft broke nearly in half on its third landing, was repaired but was later badly damaged on its 31st landing. It was rebuilt as the X-15A-2 and, with Maj. Knight at the controls, set an unofficial world speed record of Mach 6.7 on 3 October 1967. It is now on display at the USAF Museum at Wright-Patterson AFB, Ohio. Eight pilots earned their astronaut qualification in the third X-15. That aircraft was lost in the only fatal accident of the program, and Maj. Michael J. Adams received his astronaut wings posthumously.

As the years pass, the legacy of the X-15 continues to support hypersonic research and development. Lessons learned from the X-15 have helped engineers conceive and design the X-33 demonstrator (from which the VentureStar single-stage-to-orbit booster was to be developed), the X-34 reusable launch vehicle (RLV) prototype, and the hypersonic X-43 unpiloted research vehicle. Doubtless, contributions of the X-15 team will continue to influence aerospace vehicle design for decades to come.

Peter Merlin is an aerospace historian and writer. He is the author of such NASA publications as Mach 3+: NASA/USAF YF-12 Flight Research, 1969-1979 (NASA SP-2001-4525) and co-author of Donald L. Mallick's autobiography, The Smell of Kerosene: A Test Pilot's Odyssey (NASA SP-2003-4108). He is anticipating publication of Archangel to Senior Crown – Design and Development of the Blackbird (American Institute of Aeronautics and Astronautics) and X-Plane Crashes – Exploring Experimental, Rocket Plane and Spycraft Incidents, Accidents and Crash Sites (Specialty Press). As a freelance writer, Merlin has published numerous articles on the Internet as well as in a variety of periodicals, including the AIR & SPACE Smithsonian Magazine, covering subjects from aerospace history to nuclear weapon accidents. He has also appeared on such television programs as Man, Moment, Machine: Shot Down – The U-2 Spy Plane; Modern Marvels: Edwards Air Force Base; Inside Area 51; UFO: Down To Earth – Retrieval; Return to Area 51; Mystery Hunters; and Atomic Journeys: Welcome to Ground Zero. A founding member of the X-Hunters Aerospace Archeology Team, he specializes in recovering historic aircraft artifacts from crash sites in the southwestern United States, particularly in the areas surrounding Edwards and Area 51.

Apollo-Soyuz Test Project – The Final Apollo Launch

by John Tribe

It was early 1975 and I had been working advanced planning for the Space Shuttle for two years when I was asked to come back to the Apollo Engineering organization to head up the Reaction Control System (RCS) group for the final Apollo launch. Steady erosion of the workforce during the Skylab program because of headcount reductions and relocations had dangerously reduced the engineering numbers to where they could barely support one spacecraft in flow.

At one time during the lunar phase we had supported three spacecraft on a three-shift basis, 6-7 days a week with a work force of 20 engineers in RCS alone. Now, on the Apollo-Soyuz Test Project (ASTP), it would be one spacecraft on one shift, five days a week and we would have to handle it with just a couple of experienced engineers.

Don Hendrix and I would work the total RCS test and checkout activities, including the flight systems on the command and service modules, maintaining and servicing all the ground support equipment at all sites including Launch Complex 39B, the launch pad for ASTP, and loading and preparing the spacecraft for launch. We would be working for Tony Gunde, our immediate supervisor, and our working well together then was a presage for the time, ten years in the future, when Tony and Don would be working for me as two of my managers on the Space Shuttle Orbiter Launch Support Services (LSS) contract.

ASTP was a one-flight program that marked the first international manned space flight, conducted by the only two nations—the USA and the USSR—that were engaged in manned space flight, and it symbolically ended the 20 year bitter, hard-fought and expensive Space Race. Its primary purpose was to establish and test space-based rescue techniques needed by both nations.

With this in mind it was necessary to design a common docking module to allow the Apollo and Soyuz space vehicles to dock with each other and permit crew exchange. The primary Russian docking mechanism designer was a unique individual, Vladimir Syromiatnikov, an apprentice of Sergey Korolyev, the most famous and revered Russian designer who had passed away in 1966. I didn't meet Vladimir during ASTP but he came over to the USA in 1995 and worked with us in LSS on the docking module that would permit the shuttle orbiter to dock with the Russian MIR space station. He was indeed a legend by this time and an immensely interesting man to work with.

So, moving back into my old role, I settled in with Don to begin preparing the ASTP procedures and checking out our systems. Surprisingly, ASTP became one of the most enjoyable and rewarding Apollo flows we had supported. The one shift operation (except for propellant loading and the countdown) allowed us to stay totally on top of the test flow – there was no handing off to a second and third shift with the subsequent 'catching up' when you came back on station. We'd power up at the start of the shift and power down at the end – it was all very tidy.

What was also very rewarding was the bonding and camaraderie we established with the technicians and inspectors – far more than in the past because we were required to spend more time on the floor and at the pad working closely with them. Even though we all knew this was the end of the road for the Apollo program, morale was high and our work ethic very strong.



NASA Photo

Left to right: Deke Slayton, Tom Stafford Vance Brand, Alexei Leonov, and Valery Kubasov.

The flow progressed smoothly and Don and I working 12-hour shifts loaded all the hypergolic propellants into the command and service modules without incident – at least without a technical incident. We did have some toxic spills – the Hendrix 'thimbleful' that made the Snoopy schedule, as well as the inevitable nitrogen tetroxide unit overfill (because of an inaccurate sight glass) that would send a column of liquid up the vent stack and gas the hammerhead crane operator on the top of the Launch Umbilical Tower.

The launch vehicle for ASTP was a Saturn 1B, similar to that which had launched Wally Schirra, Don Eisle and Walt Cunningham in Apollo 7 in 1968. Because the mission was in low-earth orbit, there was no need for the massive Saturn V. This meant that a "milk stool" was necessary on the mobile launch platform to raise the second stage, the S-IVB and CSM spacecraft up to the same heights they were at when they were on the Saturn V.

The crew for the Apollo were Tom Stafford, the commander and veteran of Gemini and Apollo X; Vance Brand, the command module pilot making his first flight; and Deke Slayton, one of the original seven astronauts who had finally been cleared to fly on his first mission, as docking module pilot. They had all trained hard and long for this mission with the added burden of having to learn rudimentary Russian.

With all the testing and loading behind us we moved smoothly into the countdown in July 1975. I was call sign MRCS (Manned Spacecraft Reaction Control System Engineer) in the ACE Station, the spacecraft control room in the Operations and Checkout Building and "Skip" Chauvin was the NASA spacecraft test conductor with a direct voice link to the crew in the command module.

The only remaining function RCS had in the terminal countdown was to effectively "arm" the thrusters by opening propellant isolation valves and allow propellants from storage module tanks to flow into the ring manifolds and be available to feed the thrusters when they were commanded to fire. ASTP



NASA Photo

Apollo-Saturn 210 on the Launch Pad

had four individual thruster packages mounted on quads set 90 degrees apart around the service module. The thruster feed lines were linked together by these ring manifolds and also to the Propellant Storage Module (PSM). The manifolds and the PSM had all been added to the previously independent RCS quads used in the lunar missions to provide the additional propellant needed for extended Skylab and ASTP missions.

Vance Brand, the CM pilot, was to perform the "arming" task at T-30 minutes upon the direction of Skip Chauvin. As this was being accomplished, I watched in disbelief as the manifold pressures indicated that Brand had thrown the wrong switches. I had no valve indications on my console-they were just available in the crew module-but I did have the pressure data. I double-checked the figures before calling Skip and telling him that the CMP had hit the incorrect switches. Skip, in turn, called Brand and asked him to confirm the switch positions he had made and Brand then realized his mistake. By activating the quad isolation valves rather than the storage module valves, he had trapped a much larger quantity of gas upstream of the thrusters than planned. This would cause erratic thruster firings until that gas was totally expelled and could be dangerous depending on the spacecraft activities at that time.

Quick discussions with the Mission Controllers in Houston led us to decide to reconfigure the switches to their correct position for launch but they would now have to send up a special purge burn procedure to the crew to be performed in orbit to eliminate the excess gas. This would be accomplished by simultaneous firing + and - roll thrusters using two hand controllers. It was not a procedure that mission control appreciated and certainly not something they wanted to work during the waning minutes of a countdown.

Despite all these last-minute perturbations, the Apollo Saturn AS 210 vehicle with CSM 111 lifted off from LC 39B on time at 3:50 p.m. on July 15, 1975 and the USA and USSR completed their successful first docking in space, playing a significant part towards thawing the Cold War. They were docked for two days and after separating for the last time the Soyuz 19 landed in Russia while the Apollo spacecraft remained in space for three additional days to conduct on-orbit experiments. The command module began its reentry on July 24th.

However, the excitement wasn't over yet as the command module began its final descent towards a recovery in the Pacific Ocean by the carrier *USS New Orleans.* At 30,000 ft, with the CM hurtling towards the ocean at 300 mph, Vance Brand was supposed to push two switches – Earth Landing System (ELS) logic and ELS auto. This would have set into motion a complex sequence of relays and switches with programmed time delays and ultimate deployment of the main chutes. For some inexplicable reason—whether he hadn't heard Tom Stafford's reading out the steps from the Entry Checklist or whether Stafford had missed calling out the steps—Brand never performed the action.

At approximately 24,000 ft, the crew became alarmed because the drogues hadn't deployed and Deke Slayton told Brand to press the manual deploy buttons, which he did. Three seconds later the apex cover released and the drogues deployed. However, because the automatic sequencing of events had not been initiated at 30,000 ft, the CM RCS thrusters had not been deactivated. As soon as the drogues were deployed the spacecraft began swinging-a wild ride as described by previous crews-and the thrusters, responding to inputs from the on board computer to maintain attitude, began firing, the + roll thruster firing almost continuously for 6 seconds. Tom Stafford alarmed by the RCS activity reached out and closed the propellant isolation valves to stop the firings. This compounded the problem that was starting to become apparent.

At about 24,000 ft, another event had begun. The cabin pressure vent valves began to permit outside atmosphere to enter the CM to balance interior and exterior air pressures. Prior to this time the CM had been operating at an interior pressure of 5 psi. Now, with the propellant isolation valves closed and the thrusters still trying to fire; the residual nitrogen tetroxide and, to a lesser extent monomethyl hydrazine, in the manifolds began to boil off through the open thruster valves and enter the CM through the open pressure vent valves. The toxic red fumes, similar to those from concentrated nitric acid immediately started the three astronauts coughing.

As the fumes encountered any moisture they formed nitric acid and the crew could feel it stinging their skin and irritating their eyes. The gas was visible in the cabin, the odor unpleasant, and Slayton turned the cabin oxygen flow rate to high to help disperse it. Despite their obvious discomfort they were only too aware, as they approached 11,000 ft, that the main chutes had not deployed – again because ELS auto had not been selected earlier. This time they realized their switching deficiencies and finally pushed ELS logic and auto to ON but Stafford, coughing and impatient, also manually deployed the main parachutes, even though the automatic program was now working through that sequence. The chutes deployed and the CM was finally in the safe configuration for splashdown.

Although the fumes in the cabin were being rapidly dispersed by the fresh air now entering from the outside, they were still in a lot of discomfort, coughing and nauseous. At splashdown their woes were compounded when the CM went into Stable 2 position – afloat but upside down and thereby closing the cabin vent valves. Stafford released his straps and lowered himself onto the main display console, reached back and grabbed three oxygen masks from the aft bulkhead. Brand had now lost consciousness and Stafford placed a mask on his face. Brand

Apollo-Soyuz Test Project *– continued on Page 14*

An NAA Tech Rep's Date With History

by Larry Hickey and Scott Miller

Introduction

Less than three months after the United States entered World War II following the Japanese attack on Pearl Harbor, a young North American Technical Representative, Jack Fox, began an incredible war odyssey that would soon make him an important player with the Army Air Corps in the Southwest Pacific. His influence on the development of aviation armament and tactics far exceeded what would normally be expected for a factory Tech Rep. His eventual assignment to the 3rd Bombardment Group, 5th Air Force, and his subsequent association with legendary air war personalities, such as "Big Jim" Davies, the 3rd Group Commander, and Paul I. "Pappy" Gunn, became the events from which legends are born.

The North American Aviation B-25 *"Mitchell"*

Both Pappy Gunn and Jack Fox would become famous for their association with the North American B-25 *Mitchell.* At the time of the U.S. entry into World War II that aircraft was destined to become one of the most successful medium bombers of WWII. Serving in all theaters of conflict, the B-25 proved a highly adaptable design, which soon had it flying in the Pacific as a low-level strafer-attack aircraft, a role that had never been envisioned at the time of its initial design and deployment. In this role, the B-25 revolutionized the conduct of air warfare in the Pacific, thanks in no small measure to the work of Jack Fox and Pappy Gunn. It was their field modifications, later incorporated into the North American assembly lines in the U.S., that changed the mission of the B-25 aircraft as used by the Army Air Corps in the Pacific, and required the development of a whole new set of tactics for the employment of this aircraft

In January 1939, the AAF began circulating its requirements for a new "medium" bomber to replace the B-18. From this proposal came two major contenders, the NAA B-25 *Mitchell* and the Martin B-26 *Marauder.* Due to the pressures of the war in Europe, and the looming threat in the Far East from Japan, the need for new next-generation medium bombers was so great that both aircraft were ordered into production immediately, with no customary pre-production prototypes from which the inevitable bugs in a new design could be identified and corrected. The B-25 evolved from a previous NAA design, the NA-62, while the B-26 was put into full production right from the drawing boards.

The B-25 was the first to come off the production assembly line and, ironically enough, the first orders were earmarked for foreign purchase. Twenty-three B-25s were shipped to the RAF in Britain as part of President Roosevelt's Lend-Lease Program, and even more were purchased by the Dutch government in exile for use in the Netherlands East Indies, now part of Indonesia, which was being increasingly threatened by Japanese aggression in the Far East.



Photo from the Lawrence Hickey Collection

"Pappy's Folly #2" ***preparing for take-off from Dobodura, New Guinea in March 1943, with new strafer modifications and the shark mouth insignia adopted by the 90th Bomb Squadron for its strafer B-25s.***

Jack Fox Heads West

Jack Fox's first assignment as a Tech Rep, sent him to the 17th Bombardment Group, stationed at Felts Field in Spokane, Washington, as the B-25 were just rolling off the assembly lines. At the time, the Group was assigned to fly protective patrols over the American West Coast. However, many pilots from the 17th were soon assigned a new role, which resulted in arguably the most famous mission flown by the aircraft during the entire war-the April 18, 1942 "Doolittle Raid" on Tokyo off the aircraft carrier *USS Hornet*.

Fox's "folksy" speaking style and easy-going demeanor, combined with his obvious occupational competence, endeared him to the men around him. While he did not have the force of personality that inevitably commanded men to follow his lead, he was deeply respected by those around him, which gave his technical judgments added weight with his superiors.

When the shipment of B-25s was being prepared for transport to the Dutch Air Force in the NEI, Fox was selected to accompany the aircraft to the Southwest Pacific, where he would provide technical advice on the new aircraft and train the Dutch personnel responsible for maintenance of the new aircraft.

On the last day of February 1942, Jack Fox embarked aboard a B-25 for the Southwest Pacific along the newly established trans-Pacific air transport route, soon to be dubbed the "Pacific ferry route." "(I didn't) need to kid myself nor anyone else...I was worried and a little scared," Fox wrote later in his memoir. "I realized this was an experimental flight, the first of its kind for the B-25." The B-25s of this contingent were the first medium bombers to ever fly across the Pacific, transiting by an island route from the U.S. West Coast to Australia, an unheard of feat at the time. Shortly after the contingent of Dutch B-25s departed, a full bomb group of B-26s crossed by the same route, but these aircraft had to be ferried first to Hawaii by ship, then reassembled before they could complete the journey. It must be remembered that at the time, the Pacific ferry route contained almost no navigational aides, and basing facilities along the way were some of the most primitive imaginable, with the aircraft often being refueled by hand pumps from 55-gallon drums. If something as simple as a blown tire happened along the way, a replacement had to be shipped from Hawaii before a plane could resume its journey.

Despite Fox's understandable nerves, he arrived safely at Archer Field in Brisbane, Australia, where he was immediately placed under the supervision of NEI Air Force Commanding Officer (CO), Captain De Boot. Fox and the small group of American contract pilots that ferried the B-25s to Australia immediately set up a training program for the Dutch pilots and ground crews, including instructing them on some of the minor modifications made to the B-25s in advance of the trans-Pacific flight. Things were going well, but it was at this point that the rush of events in the Pacific intervened. By early March, America was being pushed out of the Philippines, and the Netherlands Indies were already under direct attack. Australian, Dutch and American forces were falling back to Australia and attempting to regroup with little or no equipment or preparations for doing so.

A Date with History

As the Japanese drove American forces from their bases in the Philippines, many American servicemen were either captured or barely escaped with their lives. Such was the case with the men of the 27th Bomb Group. They had arrived in the Philippines just before the war broke out, catching them with their dive-bomber aircraft still aboard transport ships or unassembled on docks in Australia and the Dutch Indies. The ground echelon of the 27th Bomb Group was converted into infantry units. Following their capture, they were forced to endure the horrors of the Bataan Death March and Japanese imprisonment. Most of the pilots and gunners managed to evacuate just ahead of the Japanese advance and made their way to Australia. There, they joined the newly arriving 3rd Bomb Group which was also temporarily without aircraft, or a solid commitment of when new planes would arrive. The 22nd Bomb Group, with new B-26 *Marauders*, was still in the midst of a three-month process of being deployed across the Pacific.

The U.S. needed an active air force in the theater immediately, and Jack Fox soon became part of that effort. In late March of 1942, 3rd Bomb Group CO Colonel J.H. Davies arrived at Archer Field with a group of American pilots and mechanics and requisitioned the dozen Dutch-owned B-25s that had just crossed the Pacific. Since none of the American pilots had ever flown a B-25 before, and none of the unit mechanics waiting in a primitive airfield 600 miles to the north had any idea how to maintain one, Col. Jim Davies swept a willing Jack Fox into his unit on the condition that he would return to Archer Field as soon as the American 3rd Bomb Group transitioned successfully to the new aircraft. However, Fox never returned to fulfill his contract with the Dutch.

The American contingent of B-25s, with Fox aboard the commander's aircraft, immediately flew to the unit's base at Charters Towers, a former gold-mining boom town some 80 miles southwest of Townsville on Australia's northeast Queensland coast. Fox remembered the town as something out of America's "Old West," complete with "Wooden buildings... wooden sidewalks and dirt streets which made everything dusty."

Maintenance conditions at Charters Towers were almost impossible. Parts and tools were in critically short supply, but American crews immediately began operations by whatever means necessary. Flights were able to reach the war zone in New Guinea only after a 600-mile over-water flight to the remote airfields around Port Moresby, which were undergoing daily bombing and strafing attacks by Japanese bombers and fighters. Despite these impossible conditions, Fox and the 35th Service Group were able to keep the 3rd Bomb Group B-25s in the air, flying reconnaissance and medium bombing missions against Japanese targets in New Guinea. The sense of urgency was clearly understood by all, as Port Moresby was the last Allied toehold in the Southwest Pacific north of Australia and provided a critical buffer zone between advancing Japanese forces and the Australian mainland.

From April 7th to the 24th, the 3rd Bomb Group B-25s participated in the "Royce Raid," which was ordered by General MacArthur in an attempt to break the Japanese blockade of Corregidor and open up a temporary supply route to the island. The B-25s completed five missions from a secret base on Mindanao before Japanese air attacks and dwindling supplies of fuel, ammunition and bombs forced a return to Australia.

It was following the Royce Raid that Jack Fox met the man who would become the second strand of the collaboration that not only altered Fox's service for the rest of the war, but would

change the B-25's tactical role in the theater from that of a conventional medium-altitude bomber to a heavily armed, low-level strafer. That man was Captain P.I. "Pappy" Gunn.

Pappy Gunn

It is frequently said that war brings out the best and worst in people. Heroism, courage and self-sacrifice often operate directly alongside malice, revenge and animosity. However, when that "best and worst" of human nature can be counterbalanced in a single personality, and expressed in an individual who brings vibrant tenacity to the task of defeating an enemy, a formidable military leader can emerge.

Gunn was a middle-aged ex-Navy pilot who, prior to the outbreak of war, was working in an often-futile attempt to make Philippines Airlines operational. Pressed into military service when the Japanese invaded the Philippines, Gunn was evacuated to Australia by air, but was forced to leave his wife and children behind to be interned under harsh conditions by the hated enemy. Having been assigned to the 3rd Bomb Group with the rank of Captain, Pappy Gunn made it his personal mission to kill as many Japanese military as possible to avenge his family and hasten the end of the war.

Pappy was the personification of a dynamic, effective and hard-charging leader. He was a maverick whose "let it fly" personality, colorful vocabulary and extravagant conduct endeared him to his men as much as it forced his superiors to begrudgingly tolerate his antics. Jack Fox wrote in his memoir, "Without a doubt every man in the 3rd Attack Group swore by him and loved him much... and I sincerely believe each and everyone of them, including myself, would have had gone through hell and high water for him."

Jack Fox came to admire Gunn almost immediately not only for his skill as a pilot, but also for his candor and direct way of dealing with people and problems. He carried two .45 pistols with him at all times and would routinely end sentences with the phrase, "And that's just plain English," emphasizing his often assertive and decisive command style. Fox also routinely noted in his memoir that while Gunn had a violent temper, he rarely erupted on his own men and would use his intimidating demeanor to make sure that "his boys" had the supplies and support they needed to operate at the high level that Pappy demanded.

Gunn's personality and disdain for the rules was evident when Fox and crew chief Sgt. Jack Evans joined him on a mission to Air Corps Supply in Brisbane. Fox remembered that after Gunn received what he deemed as an inadequate response to his requisition order, Pappy then stated that he was going to go through the warehouse and turning to me he said "You keep your eyes open for any B-25 parts you see and recognize." As we started to make our tour of the warehouse, we were stopped by a guard who told us that no one was permitted to go through the warehouse without permission. Pappy almost blew his top. He stepped in front of the guard and pulled out his .45s and said "This is our permission, is it enough or do I have to use them?" The guard stepped aside quickly and said with a salute, "Yes sir, Captain!" Fox later mentioned that "It proved to be a profitable trip."

Fox and Gunn formed a bond that proved to be more than simply a commander and his subordinate. Fox admired Pappy's style and initiative and Gunn respected Fox's technical skills and ingenuity. Together, they proved to be an innovative team that would produce some of the most needed and original aircraft modifications of the second World War.

The Advent of New Tactics

American air units found themselves woefully unprepared for combat in the Southwest Pacific. Moreover, the decision in Washington to give priority to defeating the Germans meant that reinforcements, equipment and manpower needs in the theater were always of secondary priority.

Japanese pressure in New Guinea was intensifying, and on May 4th, 1942, the first major Naval engagement of the Pacific war, the Battle of the Coral Sea, resulted in a tactical standoff, but a strategic victory for the Allies. The Japanese attempt to seize Port Moresby from the sea was thwarted, and their advance was temporarily halted. This left the Japanese no option but to make an attempt by land.

The Buna Campaign of July 1942 to January 1943 was the Japanese response to the Coral Sea battle, as Japan attempted to march an army through some of the most difficult terrain in the world over the Kokoda pass to Port Moresby. The 3rd Bomb Group participated throughout in the Buna Campaign, flying air support missions and sustaining significant losses.

Jack Fox worked with Pappy Gunn throughout this period to keep planes in the air, but it was becoming obvious that changes were needed in tactics and armament to make the B-25 into an effective battlefield weapon for the theater.

With General George C. Kenney assuming command of the 5th Air Force in August of 1942 and bringing with him the concept of low-level "parafrag" (parachute fragmentation) bombing, the table was set for Pappy Gunn and Jack Fox to adapt the B-25 to the needs of the Pacific theater and convert it to the low-level strafer for which it would become famous.

The Modifications

As Jack Fox conversed with the crewmen and pilots returning from combat missions, he began to hear grumbling about the lack of frontal protection in the B-25. "The Peashooter .30-caliber machine gun up front wasn't heavy enough and it sure didn't scare the Jap fighters any at all. The Japs were making frontal attacks on the B-25 aircraft and getting in telling blows..."

In an attempt to increase the firepower of the B-25, Fox removed the bombardier's nose section of a wrecked B-25 in the salvage dump at Charters Towers. Concocting a makeshift parallel rectangular gun frame of some spare steel from the 35th Service Group's welding shop, he installed a new .50-caliber machine gun in the nose, making the first field armament modification to the B-25.

While Fox was confident of his design, he never handled a .50-caliber machine gun and "...was hoping to convince a Sgt. Mitchell, who was big broad-shouldered powerful looking character, to test fire my installation. [He] felt if something did fail or I figured wrong, this guy was strong enough to manhandle the gun and hold it under control." To Fox's surprise, Mitchell declined and teasingly stated, "It's your baby, you do it, those two slim braces don't look strong enough to me". Still confident, and with a group of interested servicemen watching, Fox manned the .50-caliber gun. His design held, and soon Col. Davies gave the command to begin modifying all the B-25s by installing the new .50-caliber guns.

Pappy Gunn was impressed with Fox's modification, but had a still bigger vision for the 3rd Group's B-25s. He had long been a staunch advocate of low-level attack, arguing that it gave the enemy fewer angles of approach and allowed the pilot to take better advantage of the element of surprise. Gunn's unconventional flying style was frequently exercised in low-level flyovers of Allied airfields, much to the chagrin of his superior officers.

Fox recalled, "Pappy was in earnest about getting some real firepower in the A-20 and B-25 aircraft." The two frequently discussed different ways of arming the B-25 and would routinely jot down notes and drawings of the different possibilities.

Eagle Farm Air Base at Brisbane became the hub of the armament modification experiments, and armament officer Captain T.R. Tompkins joined the Gunn/Fox team there. These experiments had the full blessing of Gen. Kenney, who was headquartered at Eagle Farm. Kenney was especially fond of Pappy Gunn, and knew that if he gave him the necessary space, results were certain to follow. The two formed a tacit understanding that would last throughout the war: Kenney would stay off Pappy's back and Gunn would make sure not to embarrass the General.

The final product of the endeavors at Eagle Farm was truly revolutionary. Four forward firing .50-caliber machine guns were installed in the nose and secured to the structure of the bombardier's compartment. An additional four guns were also added "outside of the navigator's compartment on either side with the ammunition containers on the inside of the fuselage." This gave a devastating nose armament of eight .50-caliber guns.

In some of the aircraft, Fox had the landing lights removed from each wing panel and installed two additional .30-caliber machine guns. In another experiment, Capt. Tompkins obtained a 20 mm cannon and had it installed in the crawlway tunnel between the navigator's compartment and the cockpit, increasing the forward-firing nose armament even further.

While this cannon was installed in only a few of the resulting B-25 strafers, it was the inspiration for the later B-25G, which was armed with a much larger, factory-installed 75 mm cannon. In honor of Jack Fox's contributions to these field armament modifications, the first operational B-25G was named *"Lil' Fox"*.



Photo from the Lawrence Hickey Collection

Jack Fox stands next to* "Lil Fox"*, the first B-25G to enter service with the 75 mm cannon installed in the nose.

Validation for Jack Fox and Pappy Gunn

In a matter of months during the latter part of 1942, the B-25 had been transformed from a conventionally armed medium bomber into a virtual flying gunboat, capable of inflicting devastation on enemy shipping or airfields.

As General Kenney later described it, Pappy Gunn's low-level style of flying meshed perfectly with the newly armed B-25. "It became more and more extensively used on many enemy targets in their bombing and strafing of these targets. The flights would approach at a low altitude, strafe with their forward guns, drop their bombs, and be gone before the enemy knew what was happening."

Although strafer modified A-20s began operating in the theater as early as the end of August of 1942, the new low-level strafer attack tactics, employing another tactical innovation, skip-bombing against shipping targets, were first employed by the B-25 during March of 1943 at the Battle of the Bismarck Sea. There, the newly modified B-25s swarmed a 16-ship Japanese convoy in a devastating assault over two days, resulting in the sinking of all eight troop transports and four of the eight escorting destroyers. Thousands of Japanese sailors and infantry reinforcements were killed in the effort, and all of the vital supplies and equipment destined for the New Guinea battlefield were lost. The high point of the Japanese tidal wave that had engulfed the Southwest Pacific had passed, and from then on the Japanese would be decisively on the defensive. Pappy Gunn, Jack Fox and the B-25 skip-bombing strafers made a huge contribution to the Allied success.

B-25 contributions to the victory at the Battle of the Bismarck Sea vindicated not only the armament modifications executed by Fox and Gunn, but also confirmed Pappy Gunn's tactics of using the B-25s as heavily-armed, low-level strafers. Two full bombardment groups, the 345th and 38th, in addition to three Squadrons from the 3rd Bomb Group, would eventually utilize the B-25 in this capacity, and another group in the South Pacific Theater, the 42nd also had its planes converted in a field depot in Australia to this modification. Once developed, the concept of the B-25 as a heavily armed low-level strafer attack aircraft was thereafter used until the end of the war. Many of the field modifications pioneered by Jack Fox, Pappy Gunn and their team at Eagle Farm were adapted to the production lines back in the U.S., and subsequent model changes to the B-25 included either factory produced versions of the aircraft or came with kits for field modifying production aircraft to the strafer standard.

Their Legacy

The collaboration of Jack Fox and Pappy Gunn was one where the ideas, intuitions, judgments and actions came together to produce an advancement in military innovation that proved



Photo from the Lawrence Hickey Collection

Pappy Gunn in his modified B-25 "Pappy's Folly" in February 1943 with the eight .50-caliber macine gun field modifications visible in the nose and the R/H forward fuselage gun blister.

vital to the American war effort in the Southwest Pacific. The two men shared a mutual respect for each other that transcended the typical working relationship and allowed them to innovate beyond either of their individual capacities.

These innovations were improvements on an already excellent aircraft, the NAA B-25 *Mitchell*, which in turn had built on the innovations of numerous aircraft before it. Fox and Gunn were not doing anything extraordinary, they were simply adapting to a problem with the means they had at their disposal. This is a concept that runs deep in American military tradition.

Pappy Gunn was a visionary, a man who recognized the needs of the combat theater and created ideas to fill those needs. He also had the tenacity to see the project through to the end, and make sure that nothing got in the way of completing the mission.

Jack Fox was Gunn's "do-er," the one who could capture Gunn's vision and articulate it into a practical reality. Fox's technical expertise and practical skills helped insure that Gunn's ideas became a practical reality in a time frame that met the combat needs of the theater.

The armament modifications of Jack Fox and Pappy Gunn can truly be described as historic and played a vital role in the successful employment of American airpower in the South and Southwest Pacific. As a team, Fox and Gunn proved that American ingenuity on the battlefield is one of its greatest military assets.

About the Authors: Larry is the founder and President of International Historical Research Associates (IHRA), which is publishing the Eagles Over the Pacific *and* Eagles Over Europe *book series. An expert on the B-25 bomber, he has been a consultant for the History Channel and other projects relating to WWII aviation history. Larry resides in Boulder, Colorado with his charming wife Sue.*

Scott is a Summa Cum Laude graduate of Vanguard University in Costa Mesa, California. He has embarked on a career in historical scholarship and plans to continue his studies in England. He resides with his lovely wife Sarah in Westminster, Colorado.

For more information about IHRA books and how to order, visit our website at *www.airwar-worldwar2.com* or call the Boulder office directly at (303) 499-0530.

An Appeal from the IHRA

As part of our continuing effort to complete our Eagles over the Pacific series, the International Historical Research Associates is looking for photos and written accounts that former NAA employees may have regarding the B-25 in the South and Southwest Pacific Theaters of World War II. We are especially interested in Tech Rep material. These photos and memoirs would be considered as source material for future books. Please contact IHRA at *larry@irandpcorp.com* or (303) 499-0530 if you know of or have access to any useful material that you would like to share. Thank you!

Apollo-Soyuz Test Project

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recovered consciousness after about a minute, sufficiently to actuate the uprighting system and stabilize the CM to allow the crew to be more comfortable.

The three astronauts subsequently exited the CM after it had been hoisted on board the *USS New Orleans* and, initially, showed few signs of their problem. However, their welcoming ceremonies on the ship had to be severely curtailed as their discomfort became evident and after a brief stay in the sick bay they were transported to Tripler Hospital in Hawaii where they were detained until August 8th for two weeks of treatment and testing.

Luckily none of the three experienced any lasting effects but had their exposure become more incapacitating and precluded their reactive steps to correct the situation, the Apollo command module would have been destroyed on impact with the water. The Apollo program would have started and ended with tragedies. The three ASTP astronauts had collectively made human errors that could have been unforgiving. NASA did not advertise or cast any light on these mistakes for obvious reasons. Only later did the real story emerge.

Brand went on to fly three times as a Commander on the space shuttle. Stafford and Slayton did not fly again. Stafford retired from the USAF with the rank of Lieutenant General in 1979. Slayton retired from NASA in 1982 and passed away in 1993.

About the Author: John joined NAA Florida Launch Operations on the Apollo Program in 1965. He was the supervisor of the CSM propulsion systems for all the Apollo missions through 1972 and, again, in 1975 for the ASTP. He worked on the Space Shuttle Program from 1972 until his retirement in 1997 as Chief Engineer, Launch Support Services. Since his retirement, he is doing consultant work for Boeing and NASA and continues to support NASA Public Affairs at KSC. John resides on nearby Merritt Island, Florida with his charming wife Melinda.

46th Annual Bald Eagles Reunion

Photos by Lee French



Ed Mokslaveskas



Scott White



Shep Hill, Featured Speaker



Frank Doucette and Arthur Franson



Nelson Slagle and Clarence Baisdon



Michel Juif and Maxine Haun



















Contrails From The Past

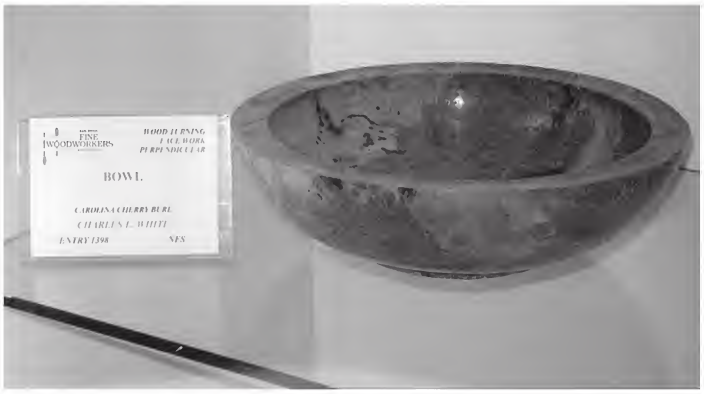
by Ed Rusinek

Dear Ed,

My wife and I are both 92, living in a wonderful retirement resort in San Diego County. I am an active woodworker, member of the Fine Woodworkers Association of San Diego. We have a completely equipped woodshop where I spend considerable time trying to use up a supply of exotic wood.

I did attend the "Gathering of Mustangs" in Columbus this past September. After sitting in the grandstand for 8 hours, I was sunburned and had to have my hearing aids overhauled. It was a great experience to see all the P-51s, restored better than new. It was an event never to be equaled.

—Charlie White, Spring Valley, CA



Ed's Ans.: Congratulations, Charlie, on your skill with exotic wood. It is always a pleasure to hear from our 92 years young readers!

Dear Ed,

The articles about the Hound Dog, Spring 2008 Issue, brought back a lot of memories. I was one of a small group of Airframe Design engineers who survived the massive Navaho cancellation layoffs. We were carried on "burden" payroll for some weeks because we were needed if the GAM-77 contract was awarded to NAA. We were all very nervous as each day dragged by because "burden" pay came out of the company's coffers and there was a limit. Finally, Bill Long, our supervisor, called our small group together. He had a very somber look on his face and we thought the worse was about to happen! His expression changed and he said, "We got the contract to build 30 missiles!" Everyone let out a big "Whoopie!"

I did the design work on the warhead door. The Stress Group found that the maximum bending moment was at the center of the door, so it had to be a fully structural door. However, because there was no body heat problem during flight, no door seal was needed.

I next was assigned to design the supports for the small atomic bomb that was to be carried in the missile. I contacted Los Alamos to get the outer details of the bomb so I could design the supports but kept being told the information was not available. Later, I found out the delays were because the bomb had not been designed yet. Finally, the design came through with the warning that the bomb supports must not allow any fuselage structural flexures to place any load on the outer shell of the bomb. This required some very sophisticated design work, but we came up with a satisfactory three-point suspension system.

Later, we were sent a dummy bomb which was to be used for fit-up tests. Since it was "Top Secret", it was kept in a big box on the shop floor, with a guard sitting on top of the box. The guard found that everyone was nosy and wanted to see what an atomic bomb looked like. He got bored and complained to Management. Management removed the bomb from the box and placed it on the shop floor next to a main aisle. Hundreds of people filed by every day without even bothering to look. There was no sign and it looked like a modern, white painted, 20-gallon hot water heater.

The project did have one feature that was quite unique. The shop folks found a way to weld the .150" thick 2024-T6 aluminum fuselage panels to the tubular structure without resulting in the large and weak grain structure characteristic of that heat-treated alloy when arc welded. Copper chill bars were placed on the inside of each butt joint and held tightly against the skin panels by a pressurized fire hose riding on a support ring. The quick cooling of the weld did the trick and it worked well.

I am 90 years old this February 4th.

—Douglas Alkire, Monterey Park, CA

Ed's Ans.: Thank you, Doug, for providing us some further insights on the Hound Dog program and Happy Birthday!

Dear Ed,

Back in the Hound Dog days, I was working for the Autonetics Inertial Navigation Engineering Systems Division and writing a proposal for the Hound Dog Inertial Navigation System ground equipment card.

One day there was a panic that required Autonetics President John Moore's personal attention. The Hound Dog Missile Engineering Test Organization (METO) had a quandary, because all of the newly delivered and installed N-5 Hound Dog Inertial Navigation systems had the same large north-pointing error during gyrocompass alignment and couldn't pass the test. They were all pointing identically several minutes of arc from true north. How could they all have identical gyro-compassing errors? This would have required all of the east-west axis gyros to have identical drift rates, an improbable malfunction.

Well, John Moore rushed a survey team in to measure the bench-azimuth reference line. It turned out to have the identical azimuth error as the gyro-compassing N-5 Inertial Navigation Systems. Evidently, METO was using a surveyed azimuth reference line that was a Downey city sewer reference line. Had METO used a U.S. Geological First Order Survey azimuth reference line, this error would not have occurred.

In summary, the Hound Dog inertial navigation system was instrumental in alerting the City of Downey which way was true north. Downey re-surveyed all of its city bench marks according to the correct true north as defined by the Hound Dog Inertial Navigation System.

—Frank Pelteson, Las Vegas, NV

Ed's Ans.: Thank you, Frank. We always enjoy when an article brings up another vignette about the subject from our readers.

COMMENTARY

WAS PEARL HARBOR A SURPRISE?

by Ed Rusinek

At the urging of our good friend and fellow NAA retiree, Rusty Harder, we have taken another look at the events that transpired at Pearl Harbor that fateful day. In 1941, Rusty was in the Navy, stationed at Pearl Harbor aboard the carrier *USS Enterprise* CV-6.

In the middle of the night of November 28th, the crew was awakened and told to prepare to sail. Before first light, *Enterprise* and its task force-Task Force 2-set sail from Oahu. First, in an easterly bearing to throw off any observers on the island and then few hours later, the Task Force turned west.

While en route, *Enterprise* received two air groups including her own Fighting Squadron Six consisting of eighteen F4F-4 "Wildcat" fighters and Marine Fighter Squadron 211 with twelve Wildcat fighters, to be delivered to Wake Island.

The pilots, anticipating that this was a weekend training mission, were ordered to report to the ready rooms, where each man was handed a single sheet of paper. The paper was titled "BATTLE ORDER NUMBER ONE" and explained that Enterprise was now operating under war conditions. It was signed by the officer commanding the ship, Capt. G. D. Murray and was approved by Vice Admiral W. F. Halsey, Commander of the Battle Force. Furthermore, the Marine pilots were told that they were not returning to Hawaii. Instead, they were being transported to Wake Island, their new station.

The planes and Marine pilots were delivered to Wake Island and the battle group set sail for return to Pearl Harbor. According to Rusty, the ships remained under combat alert and launched planes to scout the sea lanes ahead. One aircraft encountered Japanese fighters and was attacked but managed to return to the carrier with bullet holes in the tail surfaces. The plane was immediately covered with a tarp and the crew placed in quarantine. The task force then encountered a storm with heavy seas which slowed the ships and caused delay in arrival at Pearl Harbor. The task force was to arrive at Pearl Harbor on the evening of December 6th but because of the storm did not make port until the evening of the 7th. It appears that Providence stepped in! If the task force had arrived as scheduled, the ships would have been "sitting ducks" for the Japanese attackers.

The question that bears asking: What did Admiral Halsey know that seems to have escaped all the admirals and generals at Pearl Harbor? Or was this a political gambit by Roosevelt to get America into the war against the Axis Powers? If it was, it will indeed be *"A Day that shall live in Infamy!"*

Once again, our nation stands on the brink of attack. Only this time, we do not risk the loss of a fleet of ships but the loss of our nation. Our enemy is cunning and desperate, ready to die and to kill as many of us as possible in the process. To face this challenge, we need leadership that will be prepared to do whatever is necessary to protect this nation. Electing a woman or a black man would be "a unique moment in history". However, that moment will be erased and forgotten if half of our nation is converted into radioactive dust!

When we enter the voting booth in November, we must put aside all party affiliations and decide who will be the strongest and most resolute individual to lead us through this era of rage and destruction!

The Silent Majority

by Stan Guzy



LOW, G. DAVID, 52 – a NASA Astronaut who flew three space shuttle missions and later became an executive in the aerospace industry died of colon cancer on March 15, 2008 at Reston Hospital Center near his home in Sterling, VA. Low received a BS degree in Physics-Engineering from Washington & Lee University in 1978, a BS degree in Mechanical Engineering at Cornell University in 1980, and an MS Degree in Aeronautics and Astronautics from Stanford University in 1983. He joined the Jet Propulsion Laboratory until he was selected as an astronaut candidate in 1984. He held a variety of technical assignments including spacecraft communicator (CAPCOM) during the STS-26, -27, -29, and -30 missions. Low logged over 714 hours in space, including nearly six hours on a spacewalk. He was a mission specialist on STS-32 and STS-43 and a payload commander on STS-57. In 1996, he left NASA to pursue a career with Orbital Sciences Corporation. George David Low was destined to achieve. His father was George M. Low, the NASA director who suggested to President John F. Kennedy in 1960 that an astronaut could walk on the moon within the decade. Dave is survived by his wife of 15 years, JoAnn.



PARISE, RONALD A., Ph.D, 56 – the former space shuttle payload specialist died on May 9, 2008 at home in Silver Springs, MD after a three-year battle with brain cancer. An astronomer and computer specialist, Dr. Parise was one of the developers of the Ultraviolet Imaging Telescope. He logged more than 614 hours and 10.6 million miles in space flew on two space shuttle missions, STS-35/Astro-1 in 1990 and STS-67/Astro-2 in 1995 that used the Telescope to study stars and other celestial objects. He was supporting the Goddard Space Flight Center in the area of advanced spaceflight communications. He is survived by his loving wife Cecelia.

AGUILAR, HENRY V. "HANK" – of Lancaster CA passed away on February 28, 2007. Hank served for 33 years in Logistics before he retired from LAD in 1990. He also served in Downey on the Saturn and Apollo with assignments in Compton, Seal Beach, Lakewood, Palmdale, Edwards AFB, and Bay St. Louis, MS on the shuttle engines. He is survived by his loving wife Martha, also an NAA/Boeing retiree.

BARRIS, VICTOR, 80 – of Torrance, CA passed away on January 13, 2008. Vic was a tool designer at the LAD facility. He designed tools for many NAA/RI programs and retired in 1962 after 35 years of service. His loving wife Marina survives him.

BARRON, ROBERT H., 84 – aerospace executive, beloved father and devoted husband, died on January 5, 2008. A graduate of the University of Arkansas with degrees in Mathematics and Business Administration, Bob began his career with Northrop Aircraft before joining NAA in Downey, CA. At the Space Division he served as the Chief of Apollo Program Control. He was then transferred and promoted to the Tulsa Division as the Manager of Technical Operations. After several successful years he was transferred back to the West Coast to serve as the Director of Technical Operations on the B-1 Program at the Los Angeles Division. He served in that capacity until his retirement with over 34 years of service. Bob's wife of 57 years, Nadene, preceded him in death.

BLAZER, WILLIAM W., – reminder card returned marked "Deceased". He retired from NAA/RI Space Division in 1989 after 25 years of service.

BOTT, GERARD R. "JERRY", 76 – died of cancer on February 25, 2008 at his residence in Columbus, OH. Jerry served over 10 years in the Facilities Department at the NAA Columbus plant where he was in charge of all equipment and supplies.

CLAYTON, NAOMI C., 72 – died in Murrieta, CA on December 11, 2007. Naomi served for most of her adult life at Autonetics.

COMBS, JOHN, 91 – passed away on March 11, 2008 in his sleep at home in Irvine, CA. He served at LAD for 23 years, primarily in Finance.

CORTES, GEORGE, 70 – of Orange, CA died on January 17, 2008 after a long illness. George was a supervisor for the Shuttle Orbiter Ascent and Entry Systems. He is survived by his wife Thelma.

COUTURE, LEIGHTON J., 90 – passed away on November 27, 2007 in Lakewood, CA. He joined Autonetics in the late 1950s and used his extensive math skills as a cost analyst on military and space contracts. He retired with 25 years of service.

DENNIS, ROBERT F. "BOB", 75 – passed away in Lakewood, CA on March 11, 2008 from complications of Parkinson's disease. Bob retired from Space Division as a night manager in 1990 after 30 years of service in Manufacturing at Downey, Palmdale and KSC. He is survived by his loving wife of 52 years, Mary.

DESKO, ALICE E., 89 – passed away at her home in Kansas City, KS on April 11, 2008. She met and married Harry Desko during the war while they both were working at the NAA-K Bomber Plant in Fairfax, KS. They were instrumental in having a monument for the Bomber Builders erected at the Wyandotte County Historical Museum and in having a yearly reunion of all those that were associated with the B-25 production at NAA-K. She is survived by her loving husband of 65 years, Harry.

DOMINE, JAMES B. "JERRY", 80 – died on April 16, 2008 from undisclosed causes. Jerry worked for NAA at the Los Angeles division and moved to the valley area when Rocketdyne relocated to Canoga Park, CA. Jerry's wife of 56 years, Jean survives him.

DRAKE, DAVID F., 78 – a resident of Anaheim, CA passed away on December 17, 2007 from undisclosed causes. He had worked as an industrial photographer at NAA/RI for 16 years. He is survived by his caring wife, Linda.

ELWELL, MARGARET A., 77 – of Bullhead City, AZ died on February 14, 2008. She had worked at NAA/RI Autonetics for 20 plus years. Margaret is survived by her husband of 58 years, Roy Elwell, Jr.

FELDKAMP, ARA – of Thousand Oaks, CA died on June 22, 2007. Ara retired from LAD in 1969 with 20 years of service.

GAUTHIER, ARRESTIDE J. "AJ", 88 – gently passed away on March 11, 2008 at his home in Renton, WA after a long battle with pulmonary fibrosis. During World War II, he swam to safety after his troopship was sunk approaching the Philippines. He completed two tours of duty in the Pacific and was severely wounded before returning to civilian life. AJ joined LAD Tooling where he served for 20 years before retiring in 1984. He is survived by his loving wife of 63 years, Jean. She is also a retiree with 31 years of service.

GEORGES, JAMES E., 76 – of Mission Viejo, CA was reported to have passed away on April 11, 2008 after a long illness. Jim had a long career as an electronic and aerospace engineer on the Minuteman Missile Program and other projects with NAA/RI Autonetics Division. He retired in 1995 after 36 years of service and is survived by his loving wife of 54 years, Gwen.

GLAZE, D. L. "DENNY" – passed away on May 2, 2008 at his home in Whittier, CA with his wife, Kathy, at the bedside. Denny had been diagnosed with cancer last year and fought a valiant battle against the disease until his passing. Denny served in Division Transportation management at NAA/RI Space Division until his retirement in 1999 after 28 years of service.

GOMME, GERALD E., 85 – reported to have passed away on

November 9, 2007 from unspecified causes. He was a long time member of the NMA and the Bald Eagles Association. Bulletin records indicate he retired from the Rocketdyne Division in 1978 after 24 years of service.

GOZDUN, LENA F., 78 – died on April 11, 2008 at her home in San Andreas, CA from undisclosed causes. She had worked on the Apollo and Space Shuttle programs until her retirement in 1989. She was preceded in death by her husband of 41 years, Michael.

HARDY, GLENN W., JR., 93 – passed away August 12, 2007 in Tulsa, OK. Glenn began his career with NAA in 1937. In 1946 he moved to the Aerophysics Laboratories in Downey, CA and then in 1961 to the Tulsa Division where he supervised modifications to the Hound Dog Missile and assembly of SaturnV components. Bulletin records indicate he retired in 1981 after 40 years of service.

HARRIS, VAHL E., 71 – lost his battle with leukemia on March 21, 2008. Vahl retired in 1995 after 35 years of service at the NAA/RI Space Division in Downey, CA. He will be best remembered as the supervisor of the Engineering Release Desk during the Shuttle/Orbiter program. He was assisting in the development of new programs when he retired. He was an avid bowler, a biker and a traveler. He leaves his wife of 48 years, Diane.

JACOBSON, RICHARD L., "DICK", 81 – of Glendale, CA died on October 8, 2007 from heart complications. Dick started at LAD in Field Service on the T-28, F-86 and Sabreliner. His assignments took him to Europe and the Far East. He retired as a tech writer at Rocketdyne in 1991 after 37 years of service.

KERR, DONALD A., 79 – passed away on April 28, 2008 in a Fullerton, CA hospital as a result of complications brought on by COPD. He had been Chief Test/Stress Engineer on the Saturn V and GPS projects at the Seal Beach Facility. Bulletin records indicate he retired in 1989 after 27 years of service. Don is survived by his loving wife of 54 years, Pauline.

MAYNE, DAVID M., 81 – passed away at home in Long Beach, CA of natural causes on February 26, 2008. David served 45 years as a reliability engineer at NAA/Rockwell/Boeing on the Apollo, Skylab, Apollo Soyuz, Space Shuttle, and X-37 projects. He began his 66-year career in aviation and aerospace in 1942 at the DeHavilland Aircraft Company in Hatfield, England. David had an exceptional work ethic; his analyses were always precise, detailed, and thorough.

MILLER, LEROY C. "LEE", 82 – of San Marcos, CA passed away on February 22, 2008. Lee was an NAA field service representative for the B-45 in Germany and on the B-70 when it flew at Mach 3.0, and the B-1 at Edwards AFB. He retired in 1984 with 23 years of service. Lee is survived by his wife Rosemary.

MODDRELL, JAMES R., 85 – passed away in Mena, AR on January 24, 2008. He joined NAA in 1947 as a field tech rep with over 23 years of service as far away as Japan, Holland and the Philippines. He left the company in 1970 to join Fed Ex in Little Rock, AR.

NOLAN, RICHARD K., 75 – expired peacefully at his home from unspecified causes surrounded by his family. After earning a degree in Mechanical Engineering from Loyola University in 1961, he spent the next 27 years as an exceptional engineer with NAA/RI. He is survived by his loving wife, Rosemary.

PETERSON, ARTHUR F., 86 – died of cardiac arrest in Lakewood, CA on October 22, 2007. Art retired from LAD in 1978 after 29 years of service.

PUGH, WALLACE "WALLY", 87 – passed away in Ventura, CA on January 26, 2008 from the effects of Alzheimer's. Wally served in Field Service and was at the Seal Beach facility when he retired in 1990 with more than 38 years of service.

RADER, CHARLES W. "BILL", 86 – died on March 18, 2008 in Victorville, CA. After serving in the Army in the Pacific Theater, Bill had a successful career in the aircraft industry including a stint with Rockwell International where he worked on the Space Shuttle at LAD. He is buried at the National Cemetery in Riverside.

SEEHUS, DOROTHY L., 74 – died on February 28, 2008 in Buena Park, CA from unspecified causes. She was employed as an Advanced Mathematician at NAA/RI. Dorothy is survived by her spouse of 55 years, Richard.

SLEPICKA, RICHARD "DICK" – of Phoenix, AZ died on December 13, 2007. Dick retired from LAD in 1982 with 35 years of service.

SPRYER, EDWARD N., JR., 86 – died on February 5, 2008 from undisclosed causes. After graduating from the Carnegie Institute of Technology with a degree in aeronautical engineering, Ed went to work for NAA/RI and served at the Los Angeles Division for 36 years before retiring in 1985. Ed was predeceased in 1986 by his wife of 35 years, Lorna.

SUGAMURA, THOMAS N., 78 – died on September 29, 2007 just nine days short of his 79th birthday. His death was attributed to complications resulting from thyroid cancer. Tom worked as an electrical engineer with NAA/RI for 37 years until he retired in 1990. He enjoyed monthly reunions with his fellow retirees and looked forward to receiving his NAA Retirees Bulletin. He is survived by his devoted wife, Terry Sugamura.

TURNER, STEPHEN H., 76 – passed away at home in Sun City, CA on February 18, 2008. Steve joined NAA in Downey in 1951 and moved to Autonetics. From there his assignments sent him to the Columbus plant in 1977 and Atlanta in 1982. He retired from Atlanta in 1987 with 34 years of service. He is survived by his loving wife of 56 years, Ruth.

VANDERVORT, GERALD D., 65 – of Torrance, CA expired on March 18, 2008. Jerry joined NAA in 1962, filing drawings in the Tech Files department for several years before transferring to the Technical Information Center where he oversaw classified information retention and security. He retired from Boeing in 1999 and became an avid bowler.

VLACH, VINCENT J. "JIM", 90 – passed away on March 12, 2008 in Riverside, CA. Vincent was stationed at Pearl Harbor on December 7, 1941. Assigned to the USS Arizona, he was on shore leave because his wife was visiting in Honolulu that morning when the Japanese attack occurred. His ship sank in the harbor with 1,177 of his shipmates. He joined NAA in 1960 and retired from Autonetics in 1982 with 22 years of service.

WALKER, SHEILA M., 60 – passed to her reward at home in Manhattan Beach, CA on January 16, 2008. Sheila worked for NAA/RI and Boeing as a buyer for 24 years. She will always be remembered for her beautiful smile, her positive "can-do" attitude and her kind words for people.

WILSON, JAYNE S., 87 – died at her home in Torrance, CA on Easter Sunday, March 23, 2008. Jayne was a computer technician in the Metallurgical Lab at LAD. Someone in her family, including her granddaughter, always served at North American Aviation from the arrival of the company in California.

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Photo from the Peter Merlin Collection

In 1969, seven of the X-15 Test Pilots attended the ceremonies marking the transfer of the X-15 No. 1 to the Smithsonian Institution's Air and Space Museum in Washington, D.C. In attendance were (l. to r.) A. Scott Crossfield, Maj. Joe H. Engle, Maj. William J. Knight, Milton O. Thompson, Col. Robert A. Rushworth, John B. McKay, and William H. Dana. Unable to attend were Neil A. Armstrong, who was preparing for the Apollo 11 mission to the Moon, and Navy Capt. Forest Peterson, who had just assumed command of the nuclear carrier, **USS Enterprise.**

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION
Retirees Bulletin

Fall 2008

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EXPORTING AIRPLANES TO SURVIVE by Norm Avery
THE APOLLO 1 FIRE by John Tribe
DUTCH KINDELBERGER'S COLUMBUS GAMBLE by C. Paul McCormick
ROCKETDYNE, THE EARLY YEARS by Vince Wheelock



Photo Courtesy of Boeing Archives Office

In late May 1940, a contract was negotiated for the RAF to purchase 320 Mustang I airplanes, numbered AG345 to AG664, with the design to be in accordance with Project NA-73. NAA Test Pilot Bob Chilton began flight tests in May 1941 with Airplane No. AG345. Notable differences from the original NA-73X design were the extension of the carburetor intake scoop forward to the spinner and a flat panel armored glass windshield instead of a curved one.

NORTH AMERICAN AVIATION
Retirees Bulletin

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Dear NAA Retiree Bulletin Subscriber

Since becoming editor in 2001, we have made a concerted effort to enlist authors with very little success from the divisions that were formed in the 1950s. The general attitude was that the North American Aviation Retirees Bulletin was a product of the Los Angeles Division; therefore, our interests are limited to the airplanes produced in Inglewood. Well, this year, the Sleeping Giant has awakened and we are publishing articles from all divisions and test sites. From Space Division we had Ben Boykin and Ellis Katz; from Autonetics we had Gene Andreosky; from KSC we had John Tribe. In this issue we have articles by Vince Wheelock taking a look at the early days at Rocketdyne, Paul McCormick describing the fantastic growth of the Columbus Division in Ohio and John Tribe, again, with a detailed report on the Apollo 1 fire. To top off all these stories, Norm Avery takes us back to those terrible Great Depression days when every airplane company was struggling to stay alive by trying to sell their airplanes to foreign governments.

We have more great stories lined up for the Winter Issue but we are always eager for more. If you have a story that you think we could use, don't be shy. Nervous about your spelling? Don't worry! Our brilliant staff of editor will make sure it comes out perfect!

In our forty-nine years with North American Aviation/Rockwell we never met the man. However, in these years as editor, his name came up many times associated with various planes and projects. We asked him for a story once and he favored us with an article about NAA trainers. He even provided photos to go with the article including ones of his own T-6J and T-28C. We finally met him at a Bald Eagles Reunion. His name came up again in the article by Paul McCormick about Columbus. He is not Mr. "Dutch" Kindelberger. He is not Mr. Lee Atwood. But, he certainly is Mr. North American Aviation: he is Mr. Frank Compton.

One of our readers asked, in writing this quarterly summary, do we use the term "we" because "we" wish to usurp it from the Queen of England or because "we" have a small mouse in our pocket? Neither! It's because my words get "wire brushed" so thoroughly by our small but very viable staff that I feel it is a group effort!

With this issue, we have only the Winter Issue to complete the year and engage in the usual scramble to renew subscriptions. This places a heavy burden on our wonderful volunteer in charge of subscriptions, Sonnie Robertson. It would be a tremendous help if you renewed early to avoid the year-end rush! Just send us your check made out to the "Bald Eagles, Inc." for $10.00 per year or $100.00 for the lifetime "Silver Eagle" subscription. You don't have to cut out the subscription form and ruin your copy. Send your check and Sonnie will credit you with the renewal. If you send $100.00, she might even acknowledge it with a nice note! If you know of a friend that is bed ridden or getting on in years, this would be a good time to consider a gift subscription. We will send him a copy of the Winter Issue in addition to all four issues next year with a note telling him who is the thoughtful donor.

Congratulations and Best Wishes to

Gordon and Bee Toomey of Auburn, California
celebrating their 59th Wedding Anniversary

Fred and Colleen Bowman of Trinity, Texas
celebrating their 56th Wedding Anniversary

Jack and Priscilla Clark of Etowah, Tennessee
celebrating their 53rd Wedding Anniversary

Vincent and Peggy Lariviere of Riverside, California
celebrating their 50th Wedding Anniversary

Exporting Airplanes to Survive

by Norm Avery

Author's Note: An account of North American Aviation's export sales during the 1930s would not be complete without a brief summary of the exports sold by other major contemporary aircraft manufacturers at the time. These sales, as indicated in this article, are not complete but do provide the magnitude of the role assumed by exports in the survival of American aircraft firms during the tough post Depression years.

During the mid 1930s, as America was slowly recovering from the Great Depression, many foreign nations began modernizing their obsolete air forces with substantial purchases from American factories. All major companies did well with export sales although all sales were subject to the Neutrality Act and required approval of the State Department. In the interest of promoting his foreign policies, President Roosevelt eased the rules considerably.

In 1934, about 40% of American built aircraft were exported. By the first quarter of 1938, the number of exports were almost double the number exported during the same period in 1937. These sales were significant in financing much of the American technology when, during certain periods, the delivery of aircraft abroad exceeded those to the domestic services. A major advantage of the export business was that the price was far greater than to the U.S. services or commercial buyers. Not until 1940 did domestic sales began to exceed exports.

The Glenn L. Martin Company faced bankruptcy in 1934 after heavy losses on commercial flying boats. The company was temporarily saved by a loan from the Reconstruction Finance Corporation for production of 100 B-10 bombers for the U.S. Army Air Corps, which had been basically configured by the Engineering Department at Wright Field. When replacement time came, the B-10 lost to the Douglas B-18. This proved to be no disadvantage, since Martin made large sales of the B-10 to anxious foreign buyers. Between 1936 and 1937, 34 were sold to Argentina, 9 to China, 120 to Holland, 6 to Siam, 20 to Turkey and, under license, 42 were built in Spain. After nearly going under in 1934, Martin declared 1937 the company's best year ever! It was of little concern to Martin that their XA-22 lost in the attack bomber competition of 1938. In January 1939, France ordered 265 "Maryland" attack bombers and Holland ordered 120 for the protection of their oil interests in the East Indies.

Douglas was also doing well. In addition to the domestic DC-3 sales, the company sold two Douglas-Northrop Gamma bomber derivatives to China. In 1936, Japan purchased 4 A-17 attack bombers, 2 flying boats, the tri-tailed DC-4X and 22 DC-3s with license to manufacture. One hundred and fifteen units of the ill-fated DB-7, later designated the A-20, were purchased by France with substantial follow-on orders. Two hundred had been delivered by the fall of France and Britain assumed all remaining deliveries. One Gamma and one DC-2 (at double the price to TWA) were sold to Russia. In 1938, two Model 8A-1, similar to the A-17, with fixed landing gear were sold with manufacturing rights to Sweden. Eight more went to Argentina and in 1939 ten were sold to Peru and twenty to the Netherlands. In 1940, fifteen more were sold to Iraq and thirty-six to the Norwegian forces in Canada.

In 1940, Canada purchased twenty B-18 bombers. That same year Anthony Fokker in Holland became the chief foreign sales agent for Douglas, buying production and export rights for the DC transports with Douglas receiving a royalty on each plane sold.

Lockheed, a relatively small company in 1934, was trying to avoid bankruptcy. Deliveries were almost complete of their sleek plywood monoplanes designed by Jack Northrop in the late 1920s. In February, two Altairs were sold to Japan which was of little help. The all metal, twin engine and 10 passenger Electra was in the early stages of production and had exceeded estimated development costs, straining the company's finances. Domestic sales were only fair but the sale of 100 to Japan was a welcome boost. The smaller 6-passenger Electra Junior sold fairly well in the United States but in 1936 about 65 were sold to Argentina, Brazil and the Netherlands East Indies. However, the 14 passenger Super Electra was failing to compete with the Douglas DC-3 although some were sold to domestic airlines and some were in the works for Japan. By then, Lockheed began the design and development of the Model 22, the P-38, and more shop space was available than money.

Miracles do happen! Earlier in the year, the company had made studies of the Super Electra airframe as the basis for a bomber. In 1938 when the British Purchasing Commission was soliciting American aircraft companies as potential sources of anti-submarine patrol bombers, Lockheed was a likely source. With only 5 days notice, Kelly Johnson and his team made a Super Electra mockup with gun turrets and a bomb bay and were rewarded with a 25 million dollar contract for 200 examples of the plane, now named the Hudson. Thanks to this initial export sale, Lockheed became the fastest expanding aircraft company and quite literally overnight went from near bankruptcy to the big time. This order was soon followed by one for 350 more planes. Ultimately, 1,382 Hudsons were purchased by the British and another 1,302 for lend-lease.

In 1939, the Allied Purchasing Commission, consisting of Britain and France, negotiated with Lockheed for more than 600 as yet to be designed fighter aircraft capable of 400 mph. At the time, only the future P-38 had any prospects of meeting that requirement.

These negotiations and subsequent sales to foreign buyers were approved by President Roosevelt under a revised policy for sales to France and Britain. As war in Europe became even more certain and with agreement with the USAAC, a number of the newest combat planes would be diverted to these countries. In return, these countries would furnish the U.S. with current combat performance.

On Long Island in New York, the Seversky Aircraft Company (later Republic) had fallen on hard times after completing deliveries of the BT-8 trainers and P-35 fighters to the USAAC. Fortunately, they sold twenty bomber escorts to Japan and twenty to Siam. A few more sales ensured survival until the huge WWII contracts swamped the industry. Two export variants of the P-35 were sold to Russia with manufacturing rights and another twenty to the Japanese navy. In 1937, Sweden ordered a hundred of which forty were delivered and the remainder requisitioned by the USAAC.

In the small community of Downey, located east of Los Angeles, the small Vultee Aircraft Corporation was surviving with domestic sales of the V-1A single engine transport. Following the government edict that forbid single engine airliners, Vultee revised the design to a light attack-bomber variant and made substantial foreign sales as the V-11. Thirty-five were sold to China in 1935, some to Russia and forty to Turkey. The follow-on V-12 was sold to China with two assembled and forty for assembly in China.

The prominent Curtiss Aircraft Corporation in Buffalo, New York did a thriving business with their Hawk Model 75 fighter with fixed landing gear. China bought 112 in 1938, 200 were built under license in Argentina and France purchased 200 as the Hawk 75A-1 with retractable landing gear. In 1939, France ordered 430 more, followed by orders from Iran, Norway and the Netherlands East Indies. The final order from France was unfulfilled when France capitulated and Britain assumed the contract for the remaining airframes.

The Great Depression notwithstanding, North American Aviation was better financed during those difficult years than some of the other aircraft companies. It was also to North American Aviation's advantage to have entered the airplane manufacturing business shortly before a significant surge in both export sales and domestic military orders. Of equal importance, the company had a dynamic management and directors willing to take reasonable risks. Ever increasing orders during the 1930s required continual plant expansion and increased employment. Although, North American Aviation fulfilled all contracts with the American air services from 1936 to 1940, during that period the company delivered more military aircraft to foreign purchasers than to the U.S. air services.

North American Aviation's export business got off to a less auspicious beginning than that of Lockheed or Martin and their almost instant sales of hundreds of aircraft. North American export sales in 1937 were 5.1% of American aviation exports. By 1938, this figure was 10.1% and by 1939, it rose to 33.3%. These ratios dropped to 14% in 1940 when orders from the U.S. air services began a significant increase.

Except for the sale of thirty airplanes to Argentina and fifty to China, most of the North American deliveries were for only a single airplane and it was common for five or six national insignias to be seen in the final assembly line at one time.

It was the BT-9 that became the antecedent airplane for thousands of follow on trainers, attack bombers and basic combat types. Export sales began in 1935 when Argentina purchased the single Dundalk designed NA-16 prototype trainer, at the time with Civil Registry X-2080. In 1937, Argentina purchased thirty airplanes and Honduras bought three.

In 1936, Canada purchased a single BC-1 type and the following year bought the NA-44 attack bomber demonstrator with integral fuel tanks. Another single BC-1 sale was made to the Fokker Company.

The year 1937 was no better than 1936. Sweden bought two BT-9s, with one delivered disassembled. Japan purchased a single BT-9 with a larger geared engine and a three blade propeller with Mitsubishi obtaining the manufacturing rights.

And Australia bought two BC-1 types with fixed landing gear and manufacturing rights for the Commonwealth Aircraft Corporation. Late in the year, Venezuela ordered two BC-1s.



Photo from the Norm Avery Collection

The single NA-32 was a pattern aircraft sold to Australia with manufacturing rights. Based on the BC-1 design, it was powered by a Pratt & Whitney R-1340 engine and had the BT-9 type fixed landing gear.

Export sales took a profitable turn in 1938 with a sale to China of thirty-five BT-9Cs and almost concurrently, a sale of fifteen BC-1s. The purchase of seven fighters powered by 840 hp Wright engines by Peru marked the company's entry into the design and manufacture of a fighter aircraft. As the probability of a major war was becoming all too obvious, North American, in February, received its first large order when Britain purchased two hundred BC-1s types designated as the Harvard I. This contract, combined for another twenty five more in equivalent spares, was valued at $6,500,000. This was soon increased by an additional two hundred aircraft. In December, Brazil purchased twelve BT-9Cs.

In 1939, business for North American got off to a good start when, in February, France ordered 230 BT-9s and 27 more in equivalent spare parts, a contract valued at $7,000,000. In September, this order was increased by another 230 airplanes.



Photo from the Norm Avery Collection

Basically a BT-9, the single NA-20 was assigned the commercial registration number NC-16025. The airplane was demonstrated in China and Mexico. After being uprated with a Pratt & Whitney R-1340 engine, it was sold to Honduras in 1938.



Photo from the Norm Avery Collection

Essentially identical to the USAAC BT-9B, 230 of the NA-57 airplanes were ordered by France. By September, 140 were checked out by NAA test pilots Alex Burton and Roy Bodeen and delivered. In 1942, about 50 were seized by the Germans occupying France.



Photo from the Norm Avery Collection

The second fighter aircraft provided by NAA was the NA-68 ordered by Siam. Six were built, powered by the Wright Cyclone R-1820-77 engine. The triangular tail appeared later on the AT-6. All six planes were diverted to the USAAC as the P-64.

In April, China ordered 50 BC-1 types with fixed landing gear and, in May, Canada contracted for 30 Harvard I airplanes for the RCAF. The year was also noted for the largest order ever received by the company when, in November, Britain placed an order for 600 Harvard II trainers. This model differed from the Harvard I with major wing and fuselage changes and a different engine. Basically, it was the USAAC AT-6.

The final sale of the year occurred in November when Siam ordered six fighters powered by 870 hp Wright engines. All were completed, tested, paid for and awaiting shipment when the political situation in South East Asia caused the U.S. State Department to revoke the export license. All were diverted to the USAAC as the P-64. Siam had also purchased ten attack-bombers based on the NA-44. These, too, were intercepted before delivery and diverted to the USAAC as the A-27.



Photo from the Norm Avery Collection

North American Aviation's entry into fighter design was the NA-50 for Peru. Seven were built in 1938/1939 based on the BC-1 design. Power was provided by 840 hp Wright Cyclone R-1820-77 engines. Final acceptance was in April 1939.

A modest sale of three AT-6 types to Venezuela got 1940 off to a slow start and later in the month Brazil ordered thirty attack-bombers based on the NA-44.

In April, the company was advised by the British Purchasing Commission of its acceptance of a new, modern fighter in preference to the company tooling up as a second source to produce the already obsolete Curtiss P-40s for the RAF. Assigned the North American designation NA-73X, the prototype became the ancestor of the immortal P-51. The initial contract for 320 airplanes based on a yet to be designed and proven airplane may well have been the most important export contract received by NAA. This was followed in May by a sale of twelve BC-1s to Chile and 100 Harvard IIs to Canada.

Prosperity continued when, in June, Britain assumed the contract for 450 Harvard IIs which were originally ordered by France. In July, another 125 were ordered. In September, the final sale for the year was to Britain for another 300 NA-73 fighters, now identified as the Mustang I.

As the second decade between the wars drew to an ominous close, the number of American military aircraft purchased by foreign governments exceeded domestic deliveries. Between 1935 and the end of 1940, North American sold nearly 3,000 airplanes to foreign air forces. All were single engine types. The annual dollar value of exported airplanes rose from $6,000,000 in 1935 to $196,352,000 in 1940. Annual USAAC appropriations were $27,400,000 in 1935, rising to $186,250,000 in 1940. It was the large orders from Britain and France that financed the expansion of the American aircraft industry, preparing it for the great production miracle of World War II.

About the Author: Norm, a marvelous engineer, historian, and aviation author, is well known to our readers because of his many scholarly contributions to this publication. He is the author of: NORTH AMERICAN AVIATION AIRCRAFT 1934-1998 VOLUME 1, and B-25 MITCHELL, THE MAGNIFICENT MEDIUM.

Norm now resides in Agoura Hills, California.

The Apollo 1 Fire

by John Tribe



NASA Photo

The Apollo I Crew (left to right): Gus Grissom, Ed White, and Roger Chaffee on Pad 34.

It was January 1967 and the pace of work at Cape Kennedy (as Cape Canaveral was called from 1962 to 1973) and the Kennedy Space Center on Merritt Island was very demanding. We had successfully launched the first two unmanned Apollo capsules, S/C-009 and S/C-011 in February and August 1966 on Saturn I launch vehicles from Launch Complex 34 on the Cape and were getting ready to launch the first manned spacecraft, S/C-012, from the same pad. In addition, we were activating Pads 39A and 39B at KSC and Pad 37 on the Cape as the pace of the Apollo program picked up to full speed ahead.

S/C-012 was the first of the Block 1 manned spacecraft (Block 2 would be the subsequent lunar flight configuration) and it had arrived at KSC in June of 1966. It went through an intense checkout flow in the Manned Spacecraft and Operations Building (MSOB) where it had endured multiple vacuum tests in the altitude chamber (with and without the crew) to clear problems and work off squawks. Work had continued throughout this period on a 7-day/3-shift basis with just one day off at Christmas and finally S/C-012 was moved out to LC-34 on January 6, 1967 for a scheduled launch on a Saturn IB (AS-204) in February.

Flowing along behind S/C-012 was a second manned mission using S/C-014 on a Saturn IB and S/C-017, which would be the first unmanned S/C to fly on the giant Saturn V. The workload on North American Aviation (NAA) engineers and technicians with multiple flows and very tight work schedules was very heavy and home life took a back seat.

The Reaction Control Systems (RCS) group at NAA had grown during the previous year from Larry Whitacre and myself to include Marty Cioffoletti, who moved over from the Gemini/Mercury program and Paul Rolloson, a new grad from the University of Arkansas. Another two engineers, Wayne Fisher and Joel Robinson, were en route to join the group. Meanwhile, we were all working some very long hours.

The day was Friday January 27th and S/C-012 and the AS-204 stack were undergoing a "Plugs-Out" test. This procedure, OCP-K-0021, was to demonstrate all space vehicle systems and operational procedures in as near flight configuration as feasible. A simulated countdown and flight would be conducted with umbilicals disconnected and the spacecraft on simulated fuel cell power. In addition the crew were to perform an unaided egress at the conclusion of the test. The simulation would include cabin pressurization with pure oxygen to a pressure of 16.7 psia. This was similar to the procedures used in Mercury and Gemini spacecraft and despite the inherent huge increase in potential flammability that it presented, it did not merit a hazardous classification for the test. After all, we had just gone through four simulated

runs in the altitude chamber with a pure oxygen atmosphere in the cabin without issue. While many upper level managers subsequently denied knowledge of the test conditions, no one involved at all levels of management ever stopped to really contemplate exactly how hazardous such an environment could become.

It should be noted: a pure oxygen breathing environment for the crew precludes 'bends' from the nitrogen in their blood coming out of solution as the cabin pressure decreases during ascent to its space flight level of about 5 psia. In addition, from a design viewpoint, a single gas supply is far less complex and lighter in weight than a mixed gas system. The hazard of flammability in a zero gravity environment is also significantly less because there is no convection. On the ground the latter is very definitely not the case!

The "Plugs-Out" Test

As the lead engineer for the RCS group, I had assigned Paul Rolloson to cover the Plugs-Out test. Although he was a relatively new engineer, the test was reasonably benign as far as RCS activities were concerned. However, Paul needed to get home early (i.e. on time) that evening so I volunteered to cover the remainder of the procedure. Unfortunately, a series of communication glitches and an unidentifiable smell in the cabin had prolonged the test far beyond its scheduled time.

I was working from the MSOB Automated Checkout Equipment (ACE) Station that was where we conducted all spacecraft testing – not from the blockhouse or firing room where most people assumed we were. The NASA test conductor was "Skip" Chauvin and the NAA test conductor was Hank Kuznicki. Skip could communicate directly with the crew; the rest of us could listen to them but only talk to them through him.

At about 6 p.m., Skip suggested we go ahead with the simulated RCS static fire while we were waiting. In the actual countdown we would be test firing the RCS thrusters prior to flight but this test would merely be a simulation of the firing since we had no propellants on board at this time. It would be an opportunity to cycle through the switching and obtain a time hack on the operation. Consequently, I initiated the test working with Skip and Gus Grissom. It was uneventful and, unknown to me at that time, would be the last functional action on the part of the Apollo 1 crew. More communication problems caused another hold after we had finished.

At 6:30 p.m., we were still holding at T-10 minutes in the simulated countdown. I was filling the time by writing a test preparation sheet to conduct some RCS Command Module (CM) isolation valve heating tests the next day. In parallel with the Plugs-Out test, I was working with a technician on Pad 34, evaluating where to install temperature sensors on the valves. All the RCS closeout panels had been removed exposing the tanks, valves and plumbing in the 'pork chop' area of the command module. The 'pork chop' area was that volume around the base of the CM between the pressure cabin and the heat shield. He had been reaching through those open panels into the interior area checking access for the installation. When that last hold started I told him to take a break.

With the hold continuing, I was unaware of events happening in the CM that became evident after the subsequent data review. Right about 6:30 p.m., the biomed data from



NASA Photo

The Command Module RCS panel where the technician had been working.

the crew together with guidance and navigation accelerometer indications, increased oxygen flow to Grissom's suit and live microphone sounds all pointed towards movement on his part. This stopped at 6:30:45. At 6:30:55, 10 seconds later, a significant voltage transient occurred in AC Bus 2. In the ACE station, my first indication of a problem occurred at 6:31:05, a further 10 seconds after the voltage spike. It was Grissom with an exclamatory remark that sounded like "Fire!" I turned to Dave Stewart, the Stabilization and Control engineer who was sitting at the next console and said, "Did he say Fire?" Before he could answer Chaffee shouted, "We've got a fire in the cockpit". We listened in disbelief not quite appreciating what we were hearing when there was a last garbled transmission, also from Chaffee, that sounded like "We've got a bad fire—get us out—we're burning up" followed by a scream of pain and then silence. This last transmission finished at 6:31:22.

Meanwhile, unknown to us, the fire in the cabin had explosively flashed across the flammable materials, burning so rapidly that the increased internal pressure caused the pressure vessel to rupture around its base. Searing flames had blown through the failed walls of the cabin, into the pork chop area, flared out the open panels where my technician had been working and up the side of the outer heat shield, dangerously close to the live launch escape rocket atop the CM. If that solid propellant had ignited, it would have incinerated everyone on the top levels of the pad. Luckily, it was just charred and did not ignite.

In the ACE station we were stunned and Skip could raise no one on the net-we knew that something dreadful had happened. I rose from my seat and went to the wall phone in the ACE station and called my wife. I told her that we'd had an accident out on the center but I was fine and not to worry if I was much later than planned getting home. I replaced the phone and Dave Stewart picked up after me to make a similar call. He asked what was wrong with the phone—he couldn't get a dial tone... it was dead. I looked around and a security guard was locking the door of the station. The KSC emergency reaction procedure was in work and all affected areas were locked, sealed and isolated.

By this time Skip had made contact with the pad leader and technician supervisor on the A8 level of Pad 34 who had a five-man team struggling to get the outer boost protective cover off and the outer structural and inner pressure hatches open. The latter was too hot to handle and technicians burned their hands working on it while the atmosphere in the white room around the capsule was filled with dense, unbreathable smoke. Technicians took turns cycling in and out of the white room to complete the task. When the inner hatch was finally slid aside at 6:36 p.m. and the pad leader could make out through the smoke the condition of the crew, his words to Skip were, "I can't begin to tell you what it's like..." or words to that effect. We all knew then that the crew was dead.

Security came through the ACE station and collected all our procedures and "smarts" books that we always had with on station with us and we were bussed over to LC-34. The pad was a sea of lights, ambulances, and fire and security vehicles. We looked up at the A8 level and knew what remained of S/C-012 and three brave astronauts were still there (it was 0700 the next morning before the bodies were finally removed). We were taken into the ready room and were interrogated on tape as to our actions, memories, involvement in the test etc., and we were not released until 2:30 a.m. with instructions to be back in at 6:30 a.m. It would be a short night but sleep would not be easy anyway.

The Aftermath

Next morning we began the miserable task of trying to determine what had happened, poring over yards of data displays, listening over and over again to the crews' last transmissions and plotting timelines and evaluating every data point that might have relevance to the fire. Every trip back and forth to the data review area took us over the breezeway to the area near the astronaut quarters where the three red, white and blue Corvettes belonging to the dead crew were still parked. This activity went on for days and then the removal and grim disassembly of both S/C-012 and the new S/C-014 began in parallel in the Pyrotechnic Assembly Building on KSC. They were dark, depressing days until we could turn the corner and begin to recover from the accident. From this terrible accident a better and safer spacecraft would emerge together with operating procedures that would include greater oversight and safety controls. Training and configuration controls would be increased and strengthened. Wiring specifications would be reviewed and strengthened. Inspections across every aspect of the spacecraft would be increased.

Significant hardware changes that were incorporated included:

- The hatch was completely redesigned to eliminate the two-part inward-opening hatch and replaced with a single quick outward-opening hatch (as originally proposed by North American Aviation).
- Launch pad cabin atmosphere for pre-launch testing changed from 100% oxygen to 60% oxygen and 40% nitrogen to reduce support of combustion. The crew suit loops still carried 100% oxygen and after launch the 60/40 mix was gradually replaced with 100% oxygen at a cabin pressure of 5 psia.
- Vulnerable wiring was protected.
- Vulnerable plumbing carrying combustible or corrosive coolant was protected and leakage clean up would be more thorough.
- Combustible materials in the CM were eliminated or severely restricted.
- Ground-to-airborne communications were improved.

The lives of Gus Grissom, Ed White, and Roger Chaffee would not have been lost in vain. The moon was still within reach.

The Investigation

Eventually the investigations were completed and the Thompson Review Board issued its Apollo 204 Review together with a summary of what had happened in S/C-012 that dreadful night as best determined from the data available.

It is believed that the most probable cause of the ignition source was a short in an electrical power harness that ran under the access door to the lithium hydroxide canisters on the lower LH side of the cabin, next to Grissom's couch. This wire, possibly damaged by the opening and closing of the access door during build and checkout, was the prime candidate in the region selected as the probable source although the extensive destruction of the cable and door made positive determination impossible. Why it chose that moment to arc is not known although we know that Grissom was moving around up until about 10 seconds before the voltage spike was recorded. No one has ever tied his movements to the short because it cannot be proven and no one wanted to cast dispersions on a dead hero. However, to my mind, his action at that time coupled with the unprotected wire bundles and other hardware adjacent to his couch present both the site and a plausible cause for damage and a spark. Another incident that occurred during an Apollo 9 altitude ground test 2 years later – one where Jim McDivitt generated an electrostatic spark in the CM during handling of a lithium hydroxide canister – lends credence to this. (This later event warranted grounding of the canisters during all subsequent change outs.)

The spark from the short in the 100% oxygen environment needed very little flammable material for ignition, and there was plenty close by. The lower part of the cabin had a ring of debris trap netting to stop floating articles in zero-g from lodging under difficult to get to areas. In addition, there were many patches of velcro fastened to every available open area on panels throughout the CM. This velcro was installed both by design action and by crew selection to accommodate convenient attachment of articles in zero-g. Both the netting and the velcro were highly flammable and provided the transport mechanism for the fire.



NASA Photo

Looking into the hatch after the fire.

The fire burned in three stages. The first stage had a rapid temperature increase as the fire flashed up the LH wall of the cabin and across the ceiling with the cabin pressure increasing correspondingly until rupture approximately 15 seconds after the first report of fire. The last transmission from the crew also occurred at this time.

With the cabin rupture the brief second stage of the fire began. This was the period of greatest conflagration due to the forced convection resulting from the rush of gases through the ruptured pressure vessel. The swirling flow scattered firebrands throughout the cabin completing the spread of fire. The intensity at this point was indicated by the burst and burned aluminum tubing in the oxygen and coolant systems at floor level.

The third stage was characterized by rapid production of high concentrations of carbon monoxide that filled the cabin as the last of the oxygen was depleted. Heavy smoke formed and as the fire diminished from lack of oxygen the atmosphere inside became lethal. Localized burning continued around the environmental control unit close to where the fire is believed to have started as failed oxygen and glycol lines continued to supply oxygen and fuel.

Based on the positions where the crew were found it appeared that in all probability the Command Pilot (Grissom) had left his couch to get away from the initial fire and was found on the floor of the cabin with his head beneath the Senior Pilot's (White's) couch and his feet back on his own couch. The Senior Pilot remained in his couch as planned for an emergency egress attempting to open the hatch until his restraints burned through. He was found lying transversely across the cabin beneath the hatch. The pressure in the cabin acting against the inward opening pressure hatch had made opening it an impossibility until the cabin rupture relieved that pressure. At rupture, the widespread fire and the rapidly increasing carbon monoxide concentrations would have incapacitated the crew and prevented further action on their part. Meanwhile, Chaffee had remained and was found in his expected position in the RH couch.

Since part of Grissom's suit was found outside the command module, five feet from the point of rupture, it was apparent that his suit integrity was lost prior to the rupture and medical analysis estimated that crew consciousness was lost some 15-30 seconds after they lost their suit oxygen flow. The medical terminology said that loss of consciousness was due to cerebral hypoxia due to cardiac arrest resulting from myocardial hypoxia. In layman's terms there was a lack of oxygen getting to the brain, breathing stopped and then the heart. Possibility of resuscitation was irrevocably lost after four minutes. The medical analysis did not address what burns they suffered during these final stages.

Epilogue

During the week before the fire I had asked Gus Grissom if he would get the crew to sign a photograph for my parents who were visiting from England. Six months after the fire the crew secretary, Lola Morrow, called me up and said they were finally clearing out Gus' desk and they had found an envelope with my name on it. I went over and she gave it to me—it was the signed photograph of the crew. I still have it.

Notes of Clarification: Vehicle Number Assignments

1. Spacecraft and Flight Numbering confusion. The Mercury, Gemini and early Apollo spacecraft did not have named designations but were identified by their launch vehicles such as MA (Mercury Atlas), GT (Gemini Titan) and AS (Apollo Saturn). AS-201, -202, and -204 for S/C-009, -011, and -012 respectively were the flown and planned designations. The Apollo Fire Review Board actually used the terminology Apollo 204 in the title of their report (for the record AS-203 was a launch vehicle test flight without a spacecraft). The S/C-012 launch vehicle, AS-204, was subsequently used as the Apollo 5 launch vehicle for the first lunar module test flight from LC-37.

2. The terminology "Apollo 1" was assigned to the S/C-012 flight vehicle after the fire even though it would have made more sequential sense to have called it Apollo 3. As it was, no Apollo 2 and 3 flights were ever assigned. The next Apollo flight to be numbered was Apollo 4. This was the unmanned S/C-017 on the first Saturn V, AS-501, and was followed by Apollo 5 (above) and Apollo 6 the second unmanned S/C (-020) on AS-502. Finally, the first manned Block 2 S/C-101 flew as Apollo 7 on AS-205 in October 1968. After that, the sequence was consecutive from Apollo 8 through Apollo 17, the final lunar flight in 1972.

About the Author: John joined NAA Florida Operations on the Apollo Program in 1965. He was the supervisor of the CSM propulsion systems group for all the Apollo missions through 1972 and, again, in 1975 for the Apollo-Soyuz Test Project. He subsequently worked on the Space Shuttle Program until he retired in 1997 as Chief Engineer, Launch Support Services. John resides on nearby Merritt Island, Florida with his charming wife Melinda.

Dutch Kindelberger's Columbus Gamble

by G. Paul McCormick

When Curtiss Wright's F-87 Blackhawk Interceptor lost out to the Northrop F-88 Scorpion and their contract for 88 airplanes was cancelled, Curtiss had to throw in the towel and give up after 41 years of successfully manufacturing airplanes from 1909 to 1950.

When Dutch was offered the 3.5 million square foot plant owned by the U.S. Navy in Columbus, Ohio, he must have jumped with glee. His Inglewood and Downey plants were loaded with work and the Navaho intercontinental missile was coming on with very little room to expand.

The man Dutch selected to be General Manager of the Columbus plant was probably the least one expected. He chose Chuck Gallant, who had been his assistant for a number of years. Chuck had not had any hands-on experience in Engineering or Manufacturing, but he was intelligent, articulate and polished and he understood the role of subordinates.

Chuck surveyed all the units that comprised the Curtiss staff and decided to offer all of them positions with North American Aviation.

Then Chuck decided he needed a factory manager from the Inglewood plant. Stan Smithson offered him a worthy candidate in Reggie Clarke. Reggie had just finished the production of the B-45s in the rented space at the Douglas Long Beach plant. Reggie was the General Superintendent and needed a new challenge. He started at Inglewood, soon after the plant was opened, as a sheet metal worker building the all-metal fuselage of the O-47 observation plane. He quickly rose to department head and was sent to Kansas City to build B-25s, where he became General Superintendent. Reggie kept the manufacturing staff in place and brought in superintendents from LAD in the areas of tooling, sheet metal, machine parts and production control.

Next, the AJ-2 and AJ-2P programs were transferred from Downey. The T-6G and the T-28 programs were also transferred together with appropriate supervision in both Manufacturing and Engineering.

Next, the FJ-2 program was installed. This was the Navy version of the famous F-86. Columbus then became the second source for the F-86 because of the heavy demand to support the Korean War. To meet this schedule, Columbus ramped up to sixty F-86s per month and completed a total of 700 airplanes.

Then, the company needed a second source for the F-100s and 450 were built at the rate of 45 per month. In addition, Columbus built all of the F-86H models for a total of 470 units.



Photo from the Paul McCormick Collection

In 1955, the Columbus facility was expanding as new programs replaced second source programs and production lines began to grow.

In the first few years, the employment rose from 1,500 to 20,000 employees and Reggie promoted two men to the General Superintendent position, one for details and experimental and one for assembly.

With all this going on, Chuck established an engineering department. Ray Rice gave Chuck a Chief Engineer in the person of George Gehrkens. George joined NAA in 1937 and was in project engineering. He became the project engineer on the P-51 Mustang and was sent to England to help integrate the P-51s into the Eighth Air Force. We all know how successful that turned out to be.

George brought in project engineers from the Inglewood engineering departments experienced in the areas of trainers, fighters and bombers. His most significant change was bringing in Frank Compton for advanced design. Frank had worked on many proposals and new designs in Advanced Design at Inglewood.

Chuck and George were doing the customer contacts and Frank would do the proposals. George's first discovery was that the Navy was no longer interested in more FJ-3s unless the speed and range could be increased.

George and Frank came up with a proposal for the FJ-4 that featured a thinner wing and wet wing as well as a cockpit canopy reshaped all the way back to the vertical fin. The program was sold and hundreds of FJ-4s were added to the fleet.

The next win was the A3J-1, a Mach-2 carrier-based bomber for the Navy, that was the first Mach-2 vehicle in production anywhere in the United States. This was followed by the T2J-1, the Navy's first jet basic trainer, to replace the T-28s.

George and Frank had ground out three new airplanes for North American Aviation in a two-year period.

Due to the heavy commitments involved in the development of two new airplanes and a missile simultaneously, Chuck called on the consulting firm of Booz, Allen and Hamilton to help solve his management problems. The answer and solution was to establish three assistants to the president and three program managers over each area with responsibilities of that of a president for each of the programs. One was for the A3J-1 program, one was for the T2J-1, missiles and surface-based electronics, and the third for commercial programs. This change to a matrix management system approach was one of the first at NAA and proved to be very successful.

The result was that Columbus was established as a full-fledged division of North American Aviation, completely autonomous and self-supporting.

Chuck was promoted to President, Reggie to Vice President of Manufacturing and George to Vice President of Engineering.

Thus, Dutch's gamble paid off in spades and now he had won from the Navy a faster fighter, a Mach-2 bomber, and the Navy's first basic jet trainer.

Shortly after this, Dutch moved Chuck Gallant back to the Corporate Office as Executive Vice President under Lee Atwood and over all the other new divisions established. Will Yahn was promoted to President of the Columbus Division. Will had come up through Curtiss Wright as head of Contracts and Pricing, but needed some manufacturing experience and was sent to Fresno, California to head up that operation before returning to be Executive Vice President. Dick Walker advanced to Executive Vice President and John Fossnes, who had been Project Engineer on the A3J-1, had advanced to Assistant to the President A3J-1. With this, other things started to happen.



Photo from the Paul McCormick Collection

Examining the latest Hufford A350 Console in 1955 are General Manager Chuck Gallant, Factory Manager Reggie Clarke, General Superintendent Paul McCormick, Chairman of the Board Dutch Kindelberger and President Lee Atwood.

The Navy was forced to give up nuclear warheads on carriers in favor of the Triad, which consisted of the USAF's ICBMs, the USAF long-range bombers, and the Navy Polaris missiles fired from nuclear submarines. That brought the A3J-1 production line to an end.

But meanwhile, John Fossnes, in charge of a program that was shutting down, worked with the Navy and sold them on a reconnaissance version of the A3J-1, which would be redesignated as the RA-5C. This followed the Cuban Missile Crisis and the Navy needed a high-speed reconnaissance airplane. The configuration already incorporated major modifications that included a greater fuel capacity and the installation of improved high-lift devices on the wings that reduced the speeds, but would still allow landing on carriers within reasonable speeds. The changes made for additional fuel gave the slim fuselage a graceful humpback appearance. Receiving the reconnaissance version was a major coup for Columbus. In fact, it allowed Will Yahn to promote John Fossnes to Vice President.

Meanwhile, the T2J-1 ran into a problem when the Navy decided to close down the Westinghouse engine plant in Kansas City, eliminating the J34 jet engine, thus reducing the order for jet trainers from over 500 to 317 and leaving the production line idle for two years. Consequently, Will Yahn charged his Assistant for Trainers find another engine and get the program started again!

Before the production line was completed, a variety of new designs were proposed. They included a General Electric J85-GE-4 fan engine, a radar jet, and two Pratt and Whitney J60-P-6 engines. After 40 marketing trips proposing the startup with two J85s or two J60s, Admiral Gothwaite at Pensacola requested that NavAir buy two prototypes for evaluation and possible production.

Upon receiving the prototype contract for 3.3 million dollars, engineering and experimental were started and the airplanes were flown within eight months. The twin Pratt and Whitney J60s provided 6,000 pounds of thrust compared to the 3,400 pounds provided by the singular Westinghouse J34. This gave the T-2B superior performance in all categories.

We also added six hard points under the wings for future bomb racks, a feature used by Greece when it procured the trainer for its air force. The T-2B was built by the hundreds and later changed from the Pratt and Whitney engines to the General Electric J85-GE-4 engines due to lower price. The T-2s were the life blood of the Navy from the 1950s into the 21st Century and are now being phased out. North American Aviation trainers have been used to train American service pilots for over eighty years!

Meanwhile, Columbus was designing and building missiles, such as the Red Head/Road Runner target missile, for the U.S. Army. This missile was ramjet powered drone, zero-launched with a Rocketdyne solid propellant booster and sustained by a Marquardt MA-74 ramjet. After a number of developmental problems, it was successfully deployed and was followed by an electro-optical missiles series that were used in Vietnam. The Missiles function was split off from Columbus, sent to Albany, Georgia as part of Electronics Operations and, eventually, ended up in St. Louis as a current part of The Boeing Company.

After this success, the next major win for Columbus was the turboprop version of the T-28 which developed 2,450 hp for the Special Forces stationed at Eglin AFB. We also proposed on a counter-insurgency plane for the Defense Department which would be in competition with the turbo-prop T-28. In 1964, seven bidders returned proposals and Columbus won the competition with the OV-10A design. The OV-10A became the standard counter-insurgency airplane for the Air Force, Navy, and Marines and saw action in Vietnam along with the RA-5C.

As the RA-5C was phased out, the additional production of T-2s and OV-10s kept the Columbus plant operational and available for Space Division, producing major components subassemblies and details for the Space Shuttle, and for the Los Angeles Division, as a major supplier for the B-1 program. Columbus maintained this position until 1988 when the last of the 100 B-1Bs were completed.

Thus, from 1950 until 1988, the Columbus Division was a major supplier of airplanes, missiles, and electronic equipment for the U.S. Government, the Space Division, and the B-1 Division. When the Columbus Division closed in 1988, the industry said goodbye to an outstanding producer that was, unfortunately a non-survivor.

If this is the end, let this be a final salute to a grand company and a magnificent group of people whose company I shared these many years!

About the author: After spending 13 years in the Inglewood plant in Manufacturing, Paul transferred to Columbus as Superintendent Sheet Metal and a year and a half later, rose to General Superintendent Details and Experimental. In 1957, he was appointed Assistant to the President Trainer Aircraft, Missiles and Surface Based Electronics. After the go-ahead on the twin engine T-2B, Paul was named Vice President. When Missiles split off, he became Vice President Aircraft. During this period the T-28 turboprop and OV-10A were sold off. Paul remained in various management positions until the last B-1B was delivered, retired in March 1988 and consulted for the corporation for ten years. Paul currently resides in Worthington, Ohio.

North American Aircraft, Inc. Columbus Management Council – 1957



C. J. GALLANT
President



W. H. YAHN
Executive Vice President



G. R. GEHRKENS
Vice President
Engineering



M. A. HAYMORE
Assistant to President,
Commercial Programs



R. G. CLARKE
Vice President
Manufacturing



F. COMPTON
Director
Advanced Design



R. F. WALKER
Assistant to President,
A3J-1



G. P. McCORMICK
Assistant to President,
Trainers, Missiles and
Surface Based Electronics



D. PHILLIPS
Director
Personnel

Rocketdyne, the Early Years

by Vince Wheelock

With the end of World War II, North American Aviation's vision of a strong America not only placed continued emphasis on Aviation in the development of state-of-the-art aircraft systems, but an expanding horizon into Aerospace to include new technologies in missiles, space power and energy systems. This expansion over the following 10 years resulted in NAA forming four new divisions in 1955, in addition to the already existing aircraft divisions. These were (1) Missile Development Division for missiles and launch vehicles; (2) Autonetics Division for electronics systems; (3) Atomics International Division for nuclear power; and (4) Rocketdyne Division for rocket engine systems.

In 1946, NAA received a letter contract from the Air Force for analysis and design of a supersonic guided missile with a range of 175 to 500 miles. NAA formed the Technical Research Laboratory to pursue this contract and within a short period of time, the Technical Research Laboratory had grown to over 500 personnel. NAA then created a separate department and renamed it the "Aerophysics Laboratory".

While designers were aggressively analyzing requirements and designing Navaho systems, propulsion testing was initiated in the NAA Los Angeles Division East Parking Lot to gain experience and develop test data acquisition systems. Surplus JATO units and Research personnel's small thrusters were the primary systems tested.

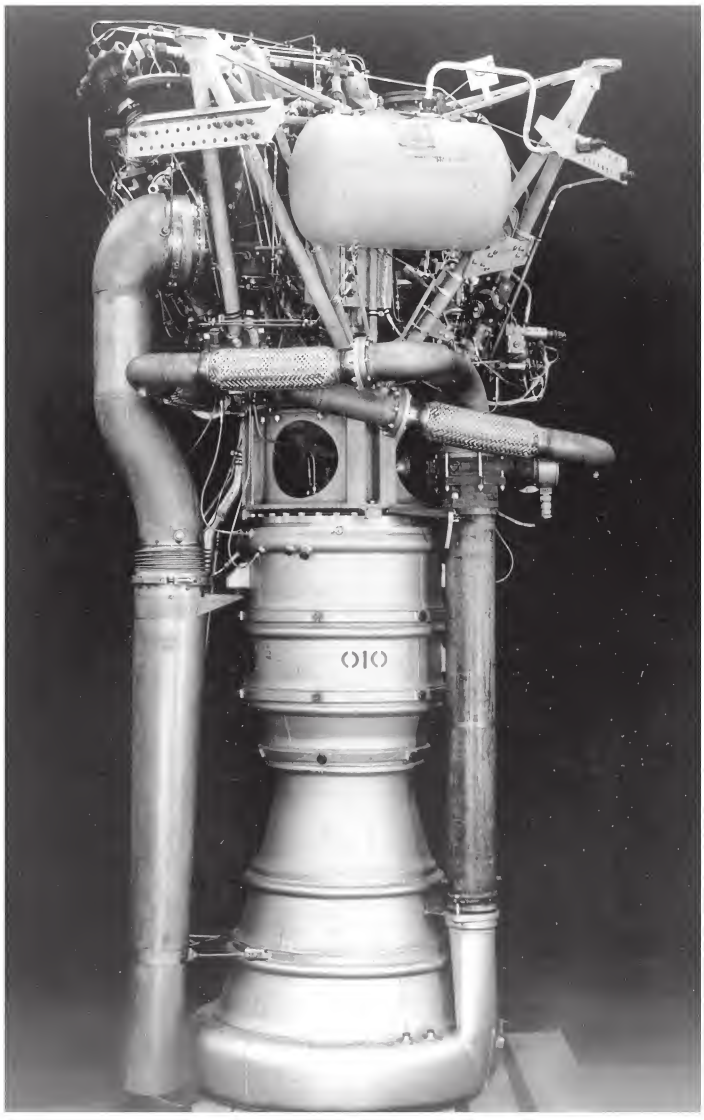
In 1948, the Aerophysics Laboratory was moved to the Consolidated Vultee factory in Downey, California and renamed "Missile and Control Equipment". At this time, work was progressing on the North American Test Instrumentation Vehicle (NATIV) and the first launch of this vehicle occurred at the Alamogordo Army base in 1948.

The NAA East Parking engine test noise levels, although impressive to many, was causing concern of nearby tenants and the thrust levels had to be greatly curtailed. Looking elsewhere for testing expansion, a site in the Santa Susana mountains was selected as NAA's first large liquid propellant engine test site. This site was perfect because it was secluded and the canyons were natural rocky bowls and provided security from viewing. Years earlier, the Chumash Indians roamed these mountains. Their big red boulders and rugged terrain later provided the backdrop for many Western movies. This test site was first named the Propulsion Field Laboratory (PFL), later the Santa Susana Field Laboratory (SSFL).

Meanwhile, the initial Navaho propulsion efforts continued with the first two phases to analyze the V-2/A-4 engine components and to Americanize them with U.S. design standards and manufacturing methods. Although, three engines were assembled, none were hot fire tested as the pace of progress was great on a new Navaho Phase Three engine with its many improvements. This introduced a totally new turbopump-fed liquid propellant engine generating 75,000 lbs of thrust at Sea Level. It was designated by the Air Force as XLR43-NA-1, or, to some, just "Engine No. One".



The Rocket Engine Test Facility located in the NAA LAD East Parking Lot with the new control center replacing the bulldozer blade that initially provided personnel protection during testing.



Using Dr. Robert Goddard's and German A-4 technology as base line data and advancing many of the design features produced a new and higher thrust engine, "Engine No. One".

The first large engine test stand at the Santa Susana site, Vertical Test Stand No. 1 (VTS-1), was activated in January 1950 with "Operation Sunrise" and a large liquid propellant thrust chamber ignition test. This was followed by a pressure-fed full thrust chamber test in March 1950 and a full-up turbopump-fed engine test, generating 75,000 lbs of thrust, in November 1950. The VTS-1 test stand stood tall to prevent erosion at the base where the rocket engine exhaust impinged. Later, water-cooled flame buckets were developed that allowed follow-on test stands to be built much closer to the ground.

During this time, the Propulsion Research Organization was busy analyzing and testing different propellant combinations, ignition systems, instrumentation and small rockets. Early emphasis on large liquid propellant propulsion systems was developing reliable hardware and uprating the thrust to meet increasing demands. The Army had selected the Redstone Missile and the Rocketdyne A-6, and later A-7, propulsion systems. The Redstone vehicles achieved many "First" in America's Space Program, namely:

- The first all American produced large ballistic missile, launched in 1953;
- America's first satellite into space, Explorer I in 1958;
- The only launch of a live atomic warhead into space that was detonated, launched from Johnson Island in the Pacific in 1958; and
- The launching of America's first man into suborbital space, Alan Shepard in 1961.



An early test firing at SSFL on VTS-1 showing Mach diamonds in the engine exhaust.

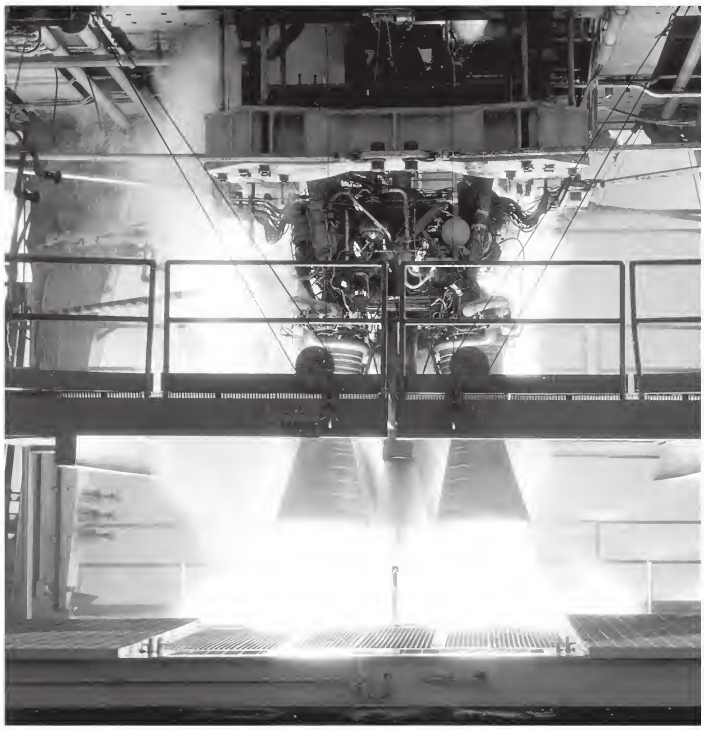
Much of the A-6/A-7 Redstone engine testing was accomplished at the White Sands Missile Range 500,000 lb thrust test stand.

The Air Force concentrated on the Navaho Missile and the Rocketdyne G-26, and later the G-38, propulsion systems. Major technology breakthroughs occurred during the Navaho engine development and the Rocketdyne Engine Advancement Program (REAP). These included increased thrust levels, change from LOX/Alcohol to LOX/RP propellants, and hinged engines for vehicle directional control.

Starting in 1950, Rocketdyne was active in providing rocket propulsion systems for various sled programs required by the Air Force. These were the Cook Sled, Air Force Sleds No. 1 and No. 2, and the Air Force RS-2 Sled. The rocket propulsion systems were pressure-fed liquid propellant rocket engines with thrusts ranging from 50,000 to 150,000 pounds. The sled designs were primarily for releasing and testing parachute recovery systems and missile inertial guidance systems.

At Santa Susana, the 1950s saw a vastly increasing number of large engine test stands and component test areas brought online to meet large liquid propellant engine numbers and requirements of the Cold War and space launch vehicles. In all, by the early 1960s, 18 large engine test stands were built, some with dual positions, along with five labs and an advanced Propulsion Test Facility supporting over 145 projects. Approximately 3,000 people worked the test facility on a seven-day, 24-hour per day schedule.

TV and movies continued at the site, only instead of Westerns, the theme was Space, Science Fiction, and Star Wars. Over the years, Santa Susana has survived through fire and floods, an occasional snowstorm, and the food at Goldie's lunch shack. Testing today of large liquid propellant rocket engines is phasing out with tests being conducted at more isolated areas;



A hot fire of a Navaho G-38 rocket engine on the test stand at SSFL. The engine was developed and generated approximately 400,000 lbs of thrust but was never flown because of contract termination.

namely, the Air Force Research Lab in California; Marshall Space flight Center in Alabama; and the Stennis Space Center in Mississippi. In November 2001, the SSFL was designated as an American Institute of Aeronautics and Astronautics Historic Aerospace Site.

In early 1955, a site was selected in Canoga Park, California close to the Santa Susana large engine test area to build a facility to house the expanding propulsion design and production activities. Propulsion people had been located at many different locations in the Los Angeles area namely Slauson, Beverly Hills, Deering, NAA Los Angeles, and Downey. On November 7, 1955, Rocketdyne became a NAA Division with Sam Hoffman the General Manager and by the end of 1955, over 2,500 personnel had been relocated to the new facility.

To meet increasing production engine demands, Rocketdyne activated a production facility in Neosho Missouri in 1956. MA-2, MA-3, and MA-5 Atlas, MB-3 Thor, H-1 Saturn, Vernier, and P4-1 Drone engines were assembled and hot fire tested there. The facility shut down in 1968 due to declining production needs.

Rocketdyne was in the solid-propellant rocket field from 1959 to 1978. A site was procured from Phillips Petroleum in McGregor, Texas that was a Naval Industrial Reserve Ordnance plant. This site housed operations for research, development, manufacture, and test of solid-propellant propulsion systems and gas-generating devices. The static test facilities consisted of seven bays for static firing of solid-propellant motors with thrusts up to three million pounds. The site was sold to Hercules, Inc. in 1978.

The Intercontinental Ballistic Missiles (ICBMs) were the ultimate goal of the United States as a deterrent to aggression. The long-range systems with a 5,500-mile range, previously considered offensive weapons, were quite a challenge in the 1950s. Therefore, interim systems were developed with intermediate ranges of 1,500 miles. These were the Thor and Jupiter missiles powered by Rocketdyne MB-3 and S-3D propulsion systems. The Thor missiles were deployed in the United Kingdom and the Jupiter missiles in Turkey and Italy. These liquid propellant ICBMs were subsequently developed and performed with amazing accuracy. The Intermediate Range Ballistic Missiles, (IRBMs), and the ICBMs were removed from service by 1965 as their function had been served as immediate deterrents in favor of the more storable, operationally friendly, solid-propellant rocket Minuteman missiles.

While the real contributors to the advancement of liquid propellant propulsion technology were the many dedicated employees of Rocketdyne, names were purposely avoided in this article because there were just too many. To represent them all, we mention our first General Manager, and later President, Sam Hoffman.

The 1960s saw Rocketdyne personnel counts peak at over 20,000 during the Cold War deployment of the ICBMs and



An aerial view of the new Rocketdyne Canoga Park facility, USAF Plant 56, at its opening in November 1955 and essentially surrounded by farm land.

gearing up for the Saturn Apollo program. This article summarized much of the Rocketdyne activities over the first 10 to 20 years, but the next 45 years saw such grand achievements of providing:

(1) Large Liquid Propellant Engines for the Saturn I and IBs, Saturn V, Atlas II, Delta II, Space Shuttle Main Engine, Delta IV, and the Reusable Launch Vehicle Technology Demonstrator;
(2) Small Space and Aircraft Engines and Thrusters for the Gemini Capsule, Apollo Command Module, Minuteman Postboost, Lance, Mars Mariner and Viking, aircraft boosters, target drones, and Peacekeeper Postboost Systems;
(3) Missile Stages for the Nomad, Homing Overlay Experiment, and Peacekeeper;
(4) Commercial/Utility Products of Jetfoil Pumps, and oil and coal slurry feed-pump systems;
(5) Solid Rockets/Rocket Motors for at least 14 different products;
(6) Atomic Energy Related Business for at least 35 different products; and
(7) many Government Non-Rocket Engine Projects such as the International Space Station Electric Power system. Some of Rocketdyne's products have probably been missed, but each has an amazing story within itself.

Rocketdyne has been recently acquired by Pratt & Whitney, a United Technologies Company, from the Boeing Company. The new division has been titled Pratt & Whitney Rocketdyne, Inc. This union provides for a stronger, more competitive rocket engine company and greater freedom to pursue business in a much downsized propulsion market.

Note: All photos are from the Author's Collection.

About the Author: After a four year stint in the USAF with service in Korea, Vince graduated in 1958 from Iowa State University with a degree in Mechanical Engineering. He then joined Rocketdyne and participated in booster rocket engine installation, checkout, test and launch of all Rocketdyne major engine systems including those for early Thor and Atlas ballistic missiles, Project Mercury, Saturn V, Apollo and Space Shuttle. He held various management positions at Rocketdyne including the Field Operations Site Manager at the General Dynamics Astronautics Facility in San Diego, California during the Cold War Atlas Missile Deployment and Project Mercury, and at NASA's Marshall Space Flight Center in Huntsville, Alabama during the Saturn V/Apollo Program. He retired as the Director of Field Engineering & Logistics in 1996 and continues to be active in propulsion support at Rocketdyne, and as a Rocketdyne Liquid Propellant Rocket Engine Historian. Vince currently resides with his charming wife Gail in Westlake Village, California.



Rocketdyne President Sam Hoffman discusses propulsion progress in the late 1960s with Dr. Wernher von Braun, NASA Marshall Space Flight Center Director and Dr. Eberhart Rees, NASA Marshall Space Flight Center Deputy Director, Technical.

Contrails From The Past

by Ed Rusinek

Dear Ed,

Enclosed is my check to extend my subscription for two more years. I wanted to let you know how much I have enjoyed the Retirees Bulletin since I retired in 1984.

My entire career at NAA since 1952 was in Tooling at LAD, Downey, Seal Beach, Palmdale, and Cape Canaveral. I was a toolmaker for seven years and then held management jobs in various tooling departments.

My wife and I had a great retirement until she died in 2004. My children and grandchildren have kept me busy since then.

—Aaron "Mac" McKelvey, Laguna Woods, CA

Ed's Ans.: Thank you for the kind words regarding the bulletin and for sharing a bit your life with us. Our deepest sympathy for the loss of your loving wife. May you enjoy your children for many years to come.

Dear Ed,

I enjoyed the article about Jack Fox very much. I was privileged to have worked with him for a short while before he retired. His fine example of working in remote wartime locations with minimal facilities to achieve desired results was mirrored by the NAA Tech Reps in other theaters.

—Lowell Ford, Torrance, CA

Ed's Ans.: Jack Fox represented the finest qualities that were so true of NAA employees. He just didn't roll up his sleeves, he took off his shirt, salvaged some metal from a scrapped B-25 fuselage and installed a 75 mm cannon in the front end of a B-25 with no blueprint, no automatic tools and a lot sweat! He then informed the engineers in Inglewood on how he did it.

Dear Ed,

In this Summer Issue, I went directly to the article about the Apollo-Soyuz because I had a special interest in it. It was my "Astronauts Patch" design that was selected by the crew from a national design competition. I met with Deke Slayton to discuss some changes that were requested. The changes were so substantial that I wondered if I had really won or if the astronauts decided it would be nice to allow a woman to be credited with the design. It has been published many times but I do not recall ever seeing it on the astronauts' flight suits.

Of great interest also was the Apollo's return to Earth—which was a near disaster. We never heard about that!

—Jean E. Pinataro, Los Angeles, CA

Ed's Ans.: It is difficult to see the details; but if you examine the photo with the article, you will see the crew patch on the left chest of each crewmember. The return to Earth was a close call but superb training and practice won the day!

Dear Ed,

The "Space Walk of Fame" museum at KSC has the names of all the contributors on display including many from North American/Rockwell. I worked with many of them at KSC.

I enjoy the articles in the bulletin, especially the one written by John Tribe. When will we get more recognition in the Bulletin?

—Thelma Martin, Buena Park, CA

Ed's Ans.: The "Space Walk of Fame" museum is located in Titusville, just outside the gates at KSC. It displays the names of all the contributors and their company affiliations. Under "Apollo" you will find many of our best known and unknown names. Sadly, many have already departed this world.
As to representation in the Bulletin, we have another article by John Tribe in this issue. We have another coming by Bill Edson. To get more representation, we need more authors to write the articles! It is simple as that!

North American Aviation Scholarship Fund

As all of you know, our company no longer exists and our very name is fading into the forgotten shadows of the past. It is tragic that the company and people that accomplished so much in the creation of flying machines that carried man faster, farther and deeper into the unknown is only a tiny footnote in the pages of history. As the years slip by, our ranks are thinning out and there are fewer of us to trumpet what we have created and what we have accomplished. The volunteer staff of your North American Aviation Retirees Bulletin have given this much thought. Thanks to you, the Bulletin is on solid financial ground. Now we are considering the implementation of a **NORTH AMERICAN AVIATION INC. SCHOLARSHIP FUND** in cooperation with a local university to provide a prestigious award with a small cash stipend yearly to the student with greatest achievement for the year. We thought of UCLA but since that institution sold off the donated Super Sonic Wind Tunnel, we are inclined toward USC. The Bulletin can get this project started by providing the seed money but we will need help from you retirees. Before we move out on this project, we want to hear from you. Are you for the project? What are your ideas? How should the students apply? What criteria should be used to pick the winner? If you have some ideas, let's hear from you! If you want to make a pledge, even better!

The Silent Majority

by Stan Guzy

BOSDET, RHODA LEE, 70 – of Gardena, CA, passed away peacefully surrounded by her family on September 24, 2006 in Torrance, CA. She was a great fan of Frank Sinatra, Willie Nelson and Kenny Rogers. Rhoda worked for many years at LAD in the Materials section and then transferred to Engineering. She retired from LAD in 1990 with 35 years of service. She is survived by her devoted husband Charles. She was a "Lost Sheep" in our last issue but now she is found.

CLARK, GEORGE M., 61 – of Northridge, CA, died on June 2, 2008. George earned his engineering degree from UC Berkeley in 1967. After post-graduate study at the Rensselaer Polytechnic Institute, he joined Rockwell where he was a mainstay in the Thermodynamics Group of the Aircraft Division. He is survived by his wife Kathy.

COFFEY, JAMES M., 78 – of Bainbridge Island, WA died in Carmel, CA on June 23, 2008. Jim worked on several projects at LAD, including the Sabreliner, Apollo and B-1, before he retired in 1989 after 35 years of service. He is survived by his wife Virginia.

ELWELL, MARGARET A., 77 – of Bullhead City, AZ, died on February 14, 2008 in Honolulu, HI. She served for 20 years at Autonetics. She is survived by her husband of 58 years, Roy Elwell Jr. and an extended family.

FEWELL, RICHARD O., 83 – of Murrieta, CA passed away on June 11, 2008 of undisclosed causes. After serving in the Navy, he joined NAA at the Space Division in Downey. Dick was very proud of his contributions to the Apollo and Space Shuttle programs. He retired in 1985 and is survived by his wife of 29 years, Claudette.

FORSYTHE, DONALD J., 69 – passed away at home in Corona, CA from undisclosed causes on June 8, 2008. He was active in community and youth sports activities. Don was a Manufacturing Manager at Autonetics. He is survived by his wife of forty years, Phyllis, and his extended family.

GALLOWAY, LESTER L. "LES", 86 – passed away on February 26, 2008 in Banning, CA of complications due to congestive heart failure. Les retired in 1973 after serving as Vice President of Manufacturing at LAD and as Manufacturing Manager of the Sabreliner Division. He is survived by his devoted wife Vicky.

GYSEN, ELMER, 85 – from Grass Valley, CA, passed away on July 20, 2008. Elmer began his NAA career in Downey, CA in Manufacturing and worked on all the major prototypes from the X-15 to the Space Shuttle. He retired in 1985 after 37 years of service. He is survived by his wife June.

KAHELIN, PAUL H., 87 – passed away on October 7, 2007 at home in El Cajon, CA of complications from prostate cancer. Paul was employed as an engineer by several aerospace companies and worked on the AC-130 Gunship, KC-135, the Scorpio, L-1011, and Atlas-Mercury projects. He retired from the B-1 Division in 1989 with 13 years of service.

LAMBERT, RALPH W., 91 – passed away peacefully on June 28, 2008 at his home in Santa Ana, CA after becoming incapacitated with Alzheimer's disease for the past six years. Ralph went to work at NAA in Los Angeles and Fresno and eventually was assigned to the NAA/RI Rocketdyne Division in Canoga Park, where he built rocket engines until his retirement in 1982. He was considered an exemplary employee his entire career. Ralph is survived by his extended family.

LANE, ROBERT D., 83 – passed away peacefully at home in Vista, CA after suffering a stroke during an angioplasty procedure in February 2008. During WWII, Bob was a P-51 flight instructor in the USAAC. He joined NAA/LAD as a stress engineer on the F-86 and retired as a project manager on the B-1 program in 1984 with 28 years of service. He is survived by his loving wife Mary.

MOHR, RONALD J. "BLACKIE" – bulletin returned, reported deceased on March 16, 2008. Records indicate Blackie retired from the Space Division in 1980 after 33 years of service.

MURPHY, EMMETT D., 74 – died of leukemia at his home in Riverside, CA on July 14, 2008. Emmett had retired from the USAF in 1984 after 28 years of service with the rank of Lieutenant Colonel. His career included flying many types of aircraft and commanding the 728th Military Airlift Squadron at Norton Air Force Base. As an electrical engineer at NAA/RI, Emmett worked on the Apollo Soyuz mission and was lead engineer in the design of the cockpit area for the Space Shuttle. He is survived by his extended family.

MURPHY, DONALD W., 90 – of Torrance, CA passed away peacefully on July 1, 2008 after a two-week battle with pneumonia. Don retired in 1978 as the head of the LAD Art Department with 39 years of meritorious service. Don, an accomplished artist and art instructor, served his community as well as his company in many ways. In 1953, as the Cub Master of Pack 2806 in Manhattan Beach, CA, he created the Pinewood Derby. During the past 55 years, over 100 million scouts have participated in the derby. Don lost his first wife, Anne after 57 years of marriage. He then met and married Muriel Bauer, who he described as the "cutest thing this side of heaven". They were each others love and companion for the past twelve years. Don is survived by his extended family.

OBENBERGER, WALLACE J. "WALLY", 81 – of Whittier, CA died on July 5, 2008 of undisclosed causes. Wally joined NAA in 1951 at Downey, CA, was transferred to Autonetics as Director of the Avionics Laboratory and then on to LAD as the head of the B-1B Software Laboratory. Wally retired in 1986 after 35 years of valued service. He is survived by his devoted wife of 55 years, Bernie.

O'TOOLE, MURRAY J., 90 – of Palos Verdes Estates, CA passed away after a short illness on June 29, 2008. Murray graduated from the University of Notre Dame, cum laude, in 1942 and joined North American Aviation as an aeronautical engineer. He worked on a multitude of airplane and space projects at LAD and Downey. He is survived by his loving wife of 40 years, Jary. She is also a NAA retiree. Murray was a gentle soul and our good friend. We shall miss him.

PAGE, SANDFORD N. "SANDY", 78 – of Norwalk, CA passed away September 16, 2007 as a result of a brain tumor. Sandy retired from Corporate-Information Systems in Seal Beach as an electrical engineer in 1990 after 38 years of service. He is survived by his devoted wife Carol.

SANDERS, HARVEY E., 79 – died on July 17, 2008 at his home in Corona, CA from undisclosed causes. He served in the

Navy in Korea before joining NAA/RI/Boeing as a Computer System Analyst. He is survived by his extended family.

SCHENDEN, RICHARD G., 77 – passed away at home in Santa Ana, CA on November 9, 2007. Dick was Director of Payroll at the Corporate Office in Seal Beach when he retired in 1987 with 33 years of service. He is survived by his loving wife Barbara Sue.

SITLINGTON, FLORENCE P., 84 – passed away on July 25, 2008 in Anaheim, CA from undisclosed causes. She had been a long time resident of Hermosa Beach and Redondo Beach while working at NAA in El Segundo for over twenty years. Flo was preceded in death by two husbands.

SVIMONOFF, CONSTANTINE "TIMO", LT. COL., USAF, 89 – passed away peacefully on July 14, 2008 at his home in Rossmoor, CA. Timo's family immigrated to America after the Russian Revolution. He earned his masters degree in Aeronautical Engineering from the California Institute of Technology in 1948. He served 24 years in the USAF as a command pilot and on the first USAF Space Program, Project Mercury. His second career began with NAA/RI where he contributed to the Saturn V Program and the B-1 Bomber. Timo retired from NAA/RI in 1985 after 21 plus years of service. He is survived by his beloved wife of 64 years, Maude.

TORREY, GLEN E., 69 – of Merritt Island, FL died on June 5, 2008. Glen started at Downey in 1962 on the Apollo program as a GSE design engineer before transferring to KSC in 1966 as the project engineer for all Apollo fluid and mechanical systems. He returned to Downey in 1972 and was responsible for the integration of all Space Shuttle flight and ground systems. In 1977, he again returned to KSC to head up the Rockwell Shuttle Project Office. From 1984 until 1989, he was the Vehicle Project Manager for the Challenger and Discovery Shuttle orbiters before becoming Manager of Shuttle Configuration Requirements and then Manager of GSE Design until his retirement. He is survived by his loving wife Marian.

TRAVIS, GORDON L., 74 – passed away on June 18, 2008 in Yorba Linda, CA. Cause of death was not disclosed. Gordon had been employed at NAA/RI/Boeing as a mechanical engineer for over 30 years and contributed to the development of the Apollo and Space Shuttle programs. He is survived by his wife, Eva, and his extended family.

VARA, JOSEPH A., 85 – of Galloway, OH died on May 6, 2008. He served in Anaheim and Columbus as a contract negotiator and pricer until he retired in 1994.

WILEY, GEORGE O., 80 – long time South Bay, CA resident and community volunteer, died June 29, 2008. After serving in the Navy, George attended Akron University and Ohio State University. He joined NAA at Columbus and moved to El Segundo in 1962. He retired from NAA/RI after 40 years and continued as a consultant for Boeing. The work ethic that marked his career also characterized his civic and volunteer work. He received many accolades and awards and was widely admired for his quick wit and wry sense of humor. He leaves his wife Violet and extended family.

WRIGHT, BETTY, 85 – passed away at her home in Lake Elsinore, CA from undisclosed causes. Betty retired from NAA/RI in 1988 after serving for 32 years. She is survived by her husband of 65 years, Ted, and her extended family.

YOUNG, RICHARD C., "DICK", 91 – died on May 17, 2008 in Templeton, CA after a very short illness caused by strep-A bacterial infection. Dick was hired in Dundalk, Maryland in August 1935 as a sheet metal helper. He was rehired in December 1936 in Inglewood as a template maker under H.V. Schwalenberg. He was promoted later to Group Leader of Lines and Dimensions. In 1962 he transferred to the Space Division as Manager of the Apollo Airframe Group staff. He retired to Paso Robles, CA in 1972 after 36 years of service. He is survived by his daughters, four grandchildren, and four great grandchildren.

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Two North American Aviation Harvard IIs being flight tested for the RAF over the Los Angeles basin as part of the follow-on Order NA-81 for two hundred airplanes in 1940. An original Order NA-66 in 1939 resulted in 598 being delivered and two crashed during flight test. Hundreds more were built as Harvard Is and IIIs for the RAF and RCAF.

A Bald Eagles Inc. Publication

NORTH AMERICAN AVIATION
Retirees Bulletin

Winter 2008

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WINNING THE NAVY'S SUPER NAVIGATOR PROGRAM by Ralph Guymon
THE MINUTEMAN I GUIDANCE AND CONTROL SYSTEM PROPOSAL
by Hal Engebretson
TAMING THE SAVAGE
by Jim Pearce



Photo from the Lawrence J. Hickey Collection
On February 16, 1944, B-25s from the 500th Squadron attacked the 420-ton Japanese Subchaser #39 off the coast of New Hanover Island. The B-25 named* "Brother Rat", *piloted by 1LT Richard B. Fritzshall, is seen just after bomb release. None of the bombs hit the ship, but harried by the attacks, it ran aground on a nearby reef. The crew was wiped out as they tried to make their way to shore. The 5,461-ton tanker,* Sanko Maru, *can be seen exploding in the background.

NORTH AMERICAN AVIATION
Retirees Bulletin

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Dear NAA Retirees Bulletin Subscriber

Well, here we are at the end of another year. Our numbers have thinned out but our hearts remain strong! As many of you have noticed, we have a new address outside of the Boeing Seal Beach facility. Access to our mailbox at Boeing had become very difficult so we now have a P.O. Box in the Seal Beach Post Office. Please direct all your mail there.

In a way, much of this issue represents the very best that was Autonetics. Talk about not only building hardware on schedule but also about inventing hardware on schedule! That was Autonetics! That is what you will find in the two articles by Hal Engebretson and Ralph Guymon. We truly believe that if the people that produced those successes were available today, they would solve our national energy problem within months! They were that good! To add some excitement, we have a nail-biter by Jim Pearce on the Taming of the Savage.

Once again, being at the end of the year, it is time to renew subscriptions! Please look on the address page. If it has above your name **DECEMBER 2008** then this is your final issue and it is time to renew. You do not have to cut out the Subscription Form on this page and ruin your copy. Simply write out a check and send it to our new address. We assure you that our charming Membership volunteer, Sonnie Robertson, will credit your account and you will continue to receive your copies of the bulletin. Incidentally, many NAA/Rockwell/Boeing retirees still are not aware that the bulletin exists. Check with your friends and if they do not subscribe, give them a gift subscription. For $10.00 they will receive a copy of this issue with a gift card from you and four more issues next year.

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The Speaker will be:
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Chairman, Aeronautics Division
Smithsonian Institution
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Winning The Navy's Super Navigator Program

by Ralph Guymon

Introduction

In September, 1955, President Eisenhower approved the development of a 1,500-mile intermediate range ballistic missile (IRBM) that would be launched under water from Fleet Ballistic Missile (FBM) submarines. Lockheed was awarded the contract to develop the solid fuel missile that came to be known as *Polaris*.

The Navy was well aware that undersea-launched missiles would require an accurate inertial navigator that could provide position, velocity and attitude information to align the missiles' guidance systems. Several companies had produced the kind of high precision inertial instruments that would be needed to build a suitable inertial navigator. But at-sea testing would have to be performed to qualify the candidate inertial navigators and lead to the selection of the winner that would be installed aboard FBM submarines.

In early 1957, the *USS Compass Island* began operations as the Navy's at-sea navigation test platform under the direction of the newly formed Strategic Systems Program Office (SSPO). This former merchant ship had become the test vehicle that would support evaluation of all navigation subsystems that would be installed on FBM submarines. SSPO chose Sperry Systems Management to oversee the testing of all the navigation equipment aboard the *USS Compass Island*.

In 1958, the Navy selected both Sperry Gyroscope Company and North American Aviation's Autonetics Division to provide Ships Inertial Navigation Systems (SINS) for the FBM submarines. Autonetics was to provide its Mark II SINS for the first five hulls in the 598 Class. Sperry was scheduled to provide its MK III SINS for the four 608 Class hulls that were to follow. Despite its long experience with marine navigation, Sperry ran into trouble with their SINS' inability to meet the tight FBM specifications.

Early in 1960, on one of his frequent trips to Washington, Autonetics' Dr. Don Pickrell was asked by SSPO's Admiral Raborn whether he could step up production to fix the schedule problems that were caused by Sperry's SINS. Dr. Pickrell assured the Navy that Autonetics could deliver the needed SINS on time, and we did. Based on Autonetics delivery performance, the Navy considered making Autonetics the sole source for SINS for all FBM submarines. SINS Project Engineer, Hugh Galt, helped tip the scales in our favor by convincing the Navy that supporting two dissimilar SINS systems in the fleet would be expensive and impractical. The Navy soon decided that Autonetics would be the sole supplier for FBM SINS.



Navigation test ship* USS Compass Island *departing Brooklyn Navy Shipyard in 1973.

The SINS worked well enough to support missile launches for several years but still had its drawbacks. SINS gyros were subject to drift error that accumulated over time. This error allowed the level stable platform to tilt which caused the level accelerometers to begin seeing gravity as a north or east acceleration. The error soon became velocity error and subsequently, position error. The heading error began to grow as well. These errors were corrected periodically by taking position fixes from satellites and calculating the quantities needed to reset latitude, longitude and the heading alignment. The reset scheme also calculated gyro bias corrections that minimized the gyro drift until the next reset calculation.

SINS performance was improved through the 1960s and the time between fix-taking was increased. This meant that the submarine could stay submerged longer and make fewer trips to the surface which reduced the probability of detection by unfriendly observers.

In the late 1960s, the Navy realized that the SINS was approaching its limit of improvement. SSPO began considering a new technology that could further increase the time between fix-taking maneuvers. By that time, Honeywell had been working with a new type of gyro for several years. Instead of a mechanical support for the spinning element of their gyro, they had developed an electric bearing that imparted very low error torques on the spinning element. This feature greatly reduced gyro drift errors. By pointing out this success to SSPO, Honeywell had obtained Navy funding to build an Electrostatically Supported Gyro Monitor (ESGM).

The ESGM was to be a super inertial navigator that would need resetting much less often than did the SINS. This would significantly decrease the submarine's vulnerability to detection by reducing its trips made to the surface to obtain fix information. The ESGM was expected to become the position information source to reset the SINS as often as needed. But SINS would still be the information source that Fire Control would use to align the missiles prior to launch.

We knew that Honeywell was well on its way to building a pre-production ESGM. In the light of this knowledge, Dr. Pickrell and his program management team concluded that Autonetics must become a competitor to Honeywell in order to stay in the FBM navigation business. In 1970, Dr. Pickrell's team succeeded in persuading the Navy to fund Autonetics for the development of six Electrostatically Supported Gyroscopes. These ESGs would be used to support instrument testing by Navy laboratories and perhaps open the door for future ESG work. Although the Navy bought six ESGs from us, they would not provide funding to help us build a competing ESGM system. We would have to do that on our own.

The Autonetics Challenge

Because Honeywell had published papers describing the basics of their ESG, we were aware of its basic construction. It was a two-axis gyro which meant that it could control two gimbals. The spinning element was a hollow sphere about the size of a ping-pong ball with a pattern etched on the surface. Optical light sources and detectors within the support cavity were used to determine where the spin axis of the ball was so that the gyro's output could be used for gimbal control. This scheme worked adequately as evidenced by the success of Honeywell's ability to get Navy money. The question was, would it work well enough to be the heart of an ESGM?

Autonetics had been working on an electrostatic gyro for an aircraft application since the early 1960s. Joe Boltinghouse and Jim Atkinson are joint holders of the Autonetics' Electrostatic Gyro (ESG) patent as well as many other patents that moved inertial instrument technology forward during their careers. Significant contributions to the ESG design were made by Ed Romberg and Dave Fincher, among many others.

The initial version of the marine ESG was fabricated in 1970. I was put on loan to Instrument Engineering to lend assistance and to learn how the ESG worked. I hoped that my new knowledge would be an asset when it came time for us to build an ESGM system.

The long held philosophy of Instrument Engineering was to create the most stable gyroscopes possible. The operating characteristics would then be found by test and analysis and used to form a model of the instrument. These characteristics would ultimately be measured and compensated by a computer at the system level. Because the ESG does not have a mechanically fixed spin axis, pickoff signals that define the location of the spin axis were uniquely determined by testing and modeling the Autonetics ESG. Fortunately for us, it was very timely that Dr. Dwayne Heckman came to Instrument Engineering to do the initial analysis on the ESG's behavior. He went on to be the technical leader of ESG application to precision underwater navigation. To the benefit of Boeing and the Navy, Dr. Heckman is still supporting the FBM program with his expertise.

Autonetics' instrument engineers had discovered early on that using a hollow ball for an ESG rotor was not a good idea. When the ball was spun at high speed, it deformed in unpredictable ways. Although these errors were small they were still too uncertain for an ESGM.

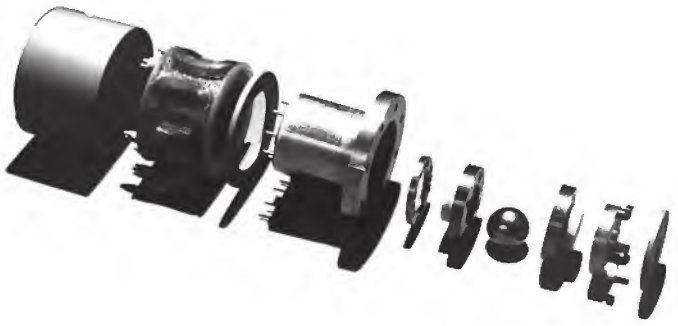
Joe Boltinghouse's solution was to make the spinning element a solid beryllium ball. The misshaping of the rotor caused by spin stress would be much more predictable. However, if the rotor were the size of Honeywell's rotor, it would be too heavy to lift with an electrostatic force. The rotor's size was reduced down to a one centimeter diameter. At this much smaller size, there was no room in the cavity to mount optical readout devices that could locate the spin axis.

The next innovation was truly inspired. If the ball were intentionally unbalanced, it would create an orbit within the support cavity. The electronic suspension system would see the orbit as modulation on the rotor position signal in the rotor's suspension servo. The gimbal controlled by the gyro would be driven until the orbit signal was nulled, which resulted in the gimbal being slaved to the gyro's spin axis. This scheme worked surprisingly well.

Unbalancing the rotor required an approach that would guarantee that all rotors would be identical and spherical at operating speed. The process was started by purchasing a cylindrical beryllium billet the size of a peach can. Two holes were then bored through the billet lengthwise and off center. Next, tantalum rods were pressed into the finished holes. The modified billet was then sent to a vendor who extruded it through a series of dies that reduced it to a rod half inch in diameter and thirty feet long. Tantalum is heavier than beryllium so that the rods achieve the intentional unbalance but tantalum also has the same extrusion resistance as beryllium so that internal stresses are minimized. The extrusion process caused the finished beryllium rod to be anisotropic, that is, the rod expanded more in the longitudinal direction than in the radial direction when heated. Back at Autonetics, an electric discharge cutter was used to cut rotor blanks from the rod. A lot of grinding was needed to get the small cylinders reshaped into small spheres. The spheres were further reduced in size to a 1-cm sphere by a random lapping process that took place in a controlled 75 °F environment. When finished, all of the rotors were the same size, spherical and uniformly unbalanced.

The next step was to fabricate the spinner, a mechanical assembly that included the rotor and its support cavity within a gas tight housing. The spinner assembly temperature was tightly maintained at 94 °F by a heater with an integrating control circuit. When the rotor was elevated from 75 °F to 94 °F, the rotor expanded along its longitudinal axis. This caused the rotor to become prolate, or football-shaped. When the rotor was spun to its full speed, the spin stresses caused it to oblate or flatten. The result was that as the rotor was spun to full speed, it became spherical.

The spinner's rotor was supported by four independent electrostatic servos whose axes met in the center of the cavity. The rotor was spun and precessed to align its spin axis by a three-axis motor that fit over the spinner. In order to attain enough angular momentum to be a super quality gyro, the rotor had to spin at 216,000 rpm. This would not have been possible if the rotor were spinning in free air. A vacuum pump that operated continuously was a major part of ESG. The pump made use of an ionizing process so that there were no moving parts. Because of its high efficiency, the pump could maintain a nearly perfect vacuum.



The ESG spinner assembly with its 3-axis motor, vacuum housing, cavity pair and rotor. A mu-metal shield protects the rotor from magnetic fields.

Even with an electric bearing and a very high vacuum isolating the rotor, it would not have kept its rotation speed constant without intervention.

Each of the four suspension servos provided its cavity plate pair with a variable voltage. This was the electrostatic force that maintained the rotor centered in the cavity even when acceleration was applied to the gyro. Because of the rotor's unbalance, a rotor orbit signal was imposed on the position pickoff signal. The servo compensation circuit in each servo included a sharply tuned notch filter that synchronously "pumped" the rotor as it orbited in the cavity. This kept the rotor at a constant speed without heating it.

Applying spin and precession torque to the rotor heated it and changed the size of the rotor. The applied heat had to be allowed to transfer from the rotor to the cavity walls before the rotor would return to its proper size and the gyro could be calibrated and used for navigation. Because of the vacuum and the shiny rotor and cavity plates, the heat transfer process took more than eight hours. This contributed to the long calibration time that was required for the ESGs. The three-axis spin motor was used only to spin up the rotor and precess it to the desired orientation during calibration. After spinup and alignment, the spin motor would not be used again until it was time to re-orient the spin axes or spin down the ESGs prior to securing them.

The clearance between the rotor and cavity was only 300 micro-inches or 0.0003 inches. Some machinists would have called this a press fit. As stated previously, lots of precision lapping was needed to get the rotor and cavity to an acceptable sphericity within a few micro inches. The electronic suspension servo was designed to hold the spinning rotor in the center of the cavity in the presence of 7 g's at low frequency. At high frequencies, the cavity could be moved into the spinning rotor faster than the servo could move the rotor along with the cavity. This limitation made the ESG sensitive to mechanical shock. I was concerned early on that there would be failures in the field caused by shock from a variety of sources. This concern diminished somewhat over the following year as ESG testing progressed without failures.

Obviously, a gyro with an electric support bearing must have a continuous supply of electricity to ensure that there will not be a catastrophic loss of rotor suspension. Suspension failure would have caused the spinning rotor to contact the cavity walls and weld itself to the cavity as the energy was dissipated. To avoid such a catastrophe, each ESG was connected to an adjacent regulator that provided the ESG's operating voltages. The regulator's supply came from either the control cabinet or the regulator's internal batteries. In case of power loss from the control cabinet, the regulator batteries had the capacity to provide support for the rotor while the cabinet's battery-powered circuits despun the rotor. The suspension servos within the ESGs could then be secured.

Although the ESG avoids the problems of mechanical rotor support by using an electric bearing, there are still error torques applied to the rotor by the electric suspension process. This causes the rotor to drift substantially. The solution to this problem was executed by mounting the spinner assembly in a rotatable case that was rotated 180° every two minutes. This averaging scheme reduced the suspension torque errors by about a thousand times.



The complete ESG. The spinner assembly, mounted within the magnetically shielded can, was rotated 180° every two minutes.

Building the ESGM Demonstration System

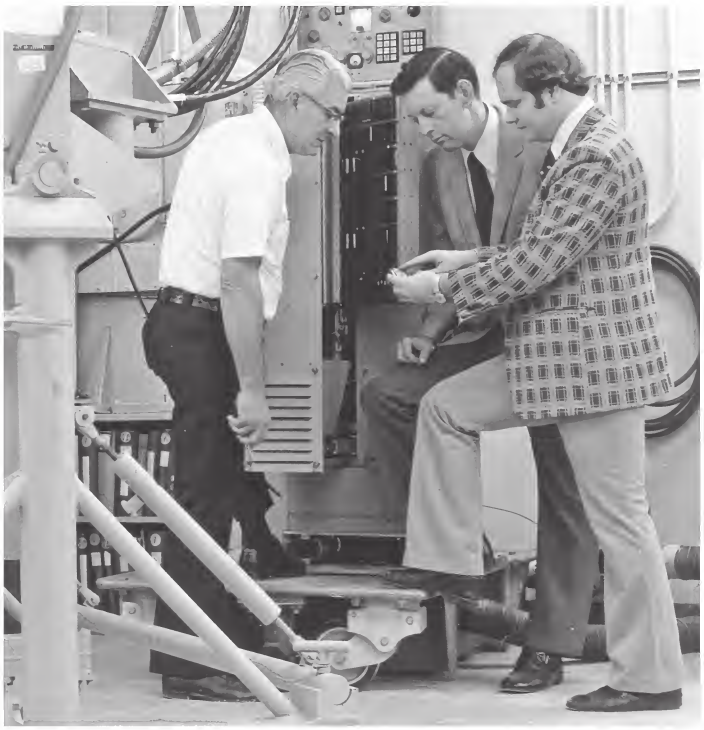
In 1971, Dr. Pickrell obtained enough company money to design and fabricate an "X Model" or Demonstration ESGM. The scheduled completion date for the fabricated and tested ESGM system was September 1973. Dave Haworth was named Project Engineer and soon established himself as a great team leader whom everyone supported.

Our ESGM system was hand built in Engineering by many guys who were trying very hard to "beat Honeywell". In fact, that was the rallying cry at every status meeting. At the same time, everyone involved appreciated the fact that the system was being built on limited money and none could be wasted. Instead of painting the equipment Navy gray, the platform housing, control cabinet and supporting equipment were painted with pale green paint that we happened to have on hand. We expected to stand out from Honeywell's more advanced equipment that would be dressed in Navy gray.

Both the stable platform housing and the control console were designed to fit through a 25-inch hatch without disassembly. This would allow equipment to be moved onto and off of an FBM submarine without having to cut a large hole in the hull. Some clever design was executed to get all of the hardware to fit within this design constraint.

Several innovations that were new to marine navigators were implemented in our ESGM. The cabinet contained three large Nickel-Cadmium batteries that were used to ensure that the system would continue to navigate in spite of 400 Hz power interruptions that were common on FBM submarines at the time. These batteries also provided power to keep the ESGs operating for more than an hour after a 400 Hz power loss. Ultimately, the batteries would support the spindown and securing of the ESGs if the 400 Hz power outage was prolonged.

The Navy insisted that the ESGM be designed using Standard Electronic Modules (SEMs) that had been developed for the FBM's Missile Fire Control system. These modules were the size of a match book with a metal frame and 40-pin connector. Each module contained several integrated circuits such as gates, flip-flops and counters or an array of components such as resistors or capacitors.



Planning the next ESGM modification in 1972. From left, Hank Weyer, Ralph Guymon, Terry Baglien.

We also designed our own special SEMs that performed functions that could not be accomplished by using the standard SEMs. All of the SEMs plugged into a large plate assembly that contained insulated pins that formed virtual connectors. Connections to the module-mating pins were made on the back of the plate using 30-gauge wire that was wire-wrapped to the pins. Surprisingly, this process provided very good and lasting connections. But the best feature of this packaging was that existing wires could easily be unwrapped and new wires wrapped in to change the circuit configuration. This ability to quickly change the design when needed was one of the reasons that we could make our schedule to deliver our Demonstration ESGM to the *USS Compass Island* for at-sea testing.

Another Navy mandate was that unlike the SINS, the navigation computer would be external to the ESGM control console. There were already several Univac computers in the FBM Navigation Center and the Navy wanted to use this proven asset instead of bringing another computer into their inventory. For the demonstration effort, we chose to mate our Development ESGM to an existing Autonetics airborne computer and we located it in an adjacent pale green cabinet. All the software for the system computer was designed from scratch. This was a big job for Barbara Conrad and her seasoned team of real-time programmers.

Assembling the demonstration system was done in a large lab so that there was a spirit of cohesiveness. Our time to complete the job was tight and surprises at the interfaces were to be avoided.

While the software was being designed and coded, a built-in maintenance panel was used to operate the ESGM. The panel provided a means to select operating modes, and spin up and precess the gyros to the desired orientation. We could also operate the four gimbal servo loops and read the gimbal angle measurements and system status words. Using the panel was complicated but we all soon learned the routines that could get the system's various functions to operate as designed. We did find some design mistakes and oversights, mainly in the servo loops and mode logic. Thanks to the ability to change the wire wrapped module sockets, these problems were alleviated quickly. Drawing updates were done with a pencil on "master" drawings and wire lists. We were very careful to ensure that everything was documented even if it wasn't pretty.

When the software was ready, we started operating the system with the new program. There were no problems with the program's ability to control the hardware so the program was given full authority to operate the ESGs and platform functions. Nonetheless, we had built safety circuits into the hardware to prevent such hazards as spinning gimbals and overheated power devices. The suspension power for the ESGs was controlled by manual switches in a protected location. We could not risk the possibility that the computer could command a power down of the ESGs while the rotors were spinning.

Calibrating the System

The ESGM was breaking ground in the way that it was to be calibrated. Previous navigation systems required the test and calibration of all its measuring devices at their production level. Electrical and optical measurements of the instruments at lower levels were needed to ensure the proper operation of the system that they supported.

The ESGM determined virtually all of its operating parameters at the system level. The first step was to calibrate the Electromagnetic Accelerometers (EMAs). The computer oriented the gimbals so that each of the accelerometers was exposed to plus and minus 1 g. The data taken was used to determine scale factors. The gimbals were then moved to get data for the accelerometer biases, non-linearity values and non-orthogonality angles among the three accelerometers. When calibration was completed, the system had a precise accelerometer triad that could measure acceleration from micro-g to 1.3 g. The maximum measurement capability of 1.3 g may seem low, but filtering squelched the effect of high frequency inputs such as heave motion in rough seas. During at-sea operation, EMA outputs never saturated.

The calibrated EMAs were then used to calibrate the multispeed (1-speed and 256-speed) resolvers on the gimbals. When the resolvers are mounted to the gimbals, they are not indexed to a gimbal reference point. Instead, the gimbals are oriented so that gravity may be used as the reference to determine the mechanical offset or bias of the resolvers. This scheme results in readout calibration down to an arc second. However, the outermost gimbal has a vertical axis that must be indexed optically so that the submarine's heading may be determined precisely.

ESGs required the most time in the system calibration sequence. During ESG calibration, the computer precessed the ESG's rotors to orient them to positions where the required terms became observable. A cool-down time was needed after each ESG precession to the next orientation. The earth's rotation acted on the ESGs to cause movement of the platform. The EMAs sensed this motion and provided data to the calibration program. Angles between the spin axes of the two

ESGs (polar and equatorial) and the axes of the EMA triad were calculated and became part of the inertial instruments' relationship. As the calibration continued, the platform was re-oriented to point the X, Y, and Z EMA input axes along the earth's pole. Data was collected during the apparent rotation of the platform. Actually, the earth was turning under the space-stabilized platform. After nine days, the computer had determined 69 compensation terms for the ESGs. The calibration was valid for at least a year. However, several of the ESG drift terms would be slightly modified by Sperry's reset process that the Navy would use at sea.

The completed Demonstration ESGM was taken across the street to our factory and mounted on a Scorsby machine that simulates at-sea motion. After the system was calibrated, it was put into the navigate mode for 20 days with the Scorsby machine operating. System performance for latitude and longitude error was well under the expected specification for an ESGM. At this point, we notified Sperry Systems Management that we were ready to ship the ESGM to Brooklyn for installation on the *USS Compass Island*. To our surprise, Sperry wanted to see further proof that our ESGM actually worked as we had just demonstrated and it was not just a random success. We were suspicious that Honeywell was not ready to ship their ESGM to Brooklyn. Although we didn't need it, we did perform additional testing that used up another month of factory time. Finally, we were given the green light to ship the ESGM to Brooklyn Navy Shipyard.

In late November 1973, our ESGM and a dozen dedicated guys from Anaheim arrived at the *USS Compass Island*, which was berthed in Brooklyn Naval Shipyard. The Autonetics contingent was made up of the hardware and system engineers who had built the ESGM in Anaheim. To our surprise, Honeywell and their ESGM had not arrived and nobody knew when they were expected. This fueled further suspicion among us that they were having system troubles at home in St. Petersburg, Florida.

Our first task was to get the equipment aboard and mounted on the foundations that had been prepared for us. This took only a couple of days, even with adaption that was needed to complete our interface to the ship. We started our nine-day calibration and carefully stored all of the spare parts that might be needed later. Because the project would last for several months, we established two teams that would alternate between the ship and Anaheim. Martin Goldsmith, an inertial systems professional, headed one team. I headed the other team. One of our team was always near our equipment because we were concerned that curious visitors might trigger an alarm that would result in a calibration abort.

While the ship was in port, the Navy took the opportunity to make repairs to the ship and there was a lot of equipment and material being moved onto the main deck overhead. A few days after the calibration had begun; our ESGM suddenly exited the calibration mode and flashed several alarm indicators. One of our engineers, who had been tending the system, mentioned that there was a very loud metallic crash overhead just before the system aborted the calibration. A sailor told us that a large steel plate had just been dropped onto the main deck. Within a few minutes, I discovered that the ESGM polar ESG was inoperative. Suddenly, it seemed probable to us that the steel plate incident had put enough shock into our overhead mount to kill the polar ESG. We theorized that the transmissibility of all the structures between the ship's main deck and our polar ESG must have had similar resonances. This would have provided a path for a high frequency vibration (shock) to get to the ESG without the attenuation that our intuition would have expected. We carefully documented this event because a fix would have to be made to the stable platform mounting system before we could sell production ESGMs to the Navy. We replaced the polar gyro with a spare and re-started the nine-day calibration.

Another nine days passed and we were fully calibrated and ready to go to sea. Honeywell had still not arrived with their ESGM. We began to wonder if they were going to show up at all. The story from Sperry was that they would meet us at Port Canaveral in Florida several days later. Since the Honeywell plant was in St. Petersburg, which was directly west of the Port Canaveral, it would be convenient for them.

The ship sailed from Brooklyn and arrived at Port Canaveral three days later. Our ESGM seemed to be working well but we were not allowed to see any of the error data. The Honeywell contingent was waiting for the ship when we arrived and began installation of their handsome hardware immediately. Even though our pale green system was working well, we decided to re-calibrate it again because we had time before the next at-sea period. We were becoming comfortable with the reality that Sperry Systems Management had been tasked by the Navy to manage what was to be an at-sea performance competition between Autonetics and Honeywell. In short order, the two companies were separated with curtains around the equipment and conversation between the two competitors was discouraged. However, both contingents were cordial and curious when we met each other outside the navigation center.

We were surprised that Honeywell had sent only a few field engineers who had been drawn from other programs to man their ESGM during the at-sea testing. As stated earlier, we were staffed with the guys who had created our ESGM. In addition, we had deep support from our own field engineers who were assigned to support the older SINS during at-sea testing. We soon noted that the Honeywell guys seemed confident that they had already won the contract and that this at-sea testing was just a formality. We became very interested in how well Honeywell was doing. Because Sperry kept a watchful eye on everything, we never found out how well they were doing in Florida. However, we did take notice that their calibration process seemed to have problems because they kept getting visitors from St. Petersburg who poured over their data with concerned faces.

Finally, both ESGMs completed their calibrations. On December 15, the *USS Compass Island* departed Port Canaveral for a week of at-sea testing. At the end of the test period, the ship would be back at its home pier in the Brooklyn Navy Shipyard.

On the second day at sea, the weather began deteriorating. We encountered a storm that carried unexpected high wind and large sea states. As the ship took 25-degree rolls, dishes in the galley crashed to the deck and broke. Articles in the ship's store were dumped from their shelves into heaps on the deck.

Suddenly, our ESGM lost control of its gimbals and down-moded from Navigate to Gimbals Caged. Most of our contingent was seasick and unable to investigate the problem. I

didn't feel well either but was able to get an oscilloscope tied down and started looking for the problem in the gimbal servo loops. Don Finley, who was senior staff to our Anaheim Head, Jim Cozad, was riding the ship as a VIP visitor. He would be named VP and General Manager of the new Marine Systems Division several months later. An old hand in the navigation business and apparently unaffected by the ship's motion, Don offered to lend assistance in the troubleshooting. He was a good technician.

Since the gimbals were now caged, I moved each of them by hand and watched the response of the gimbal motor voltage. The maximum voltage expected was 28 volts, but one of the gimbal motors was only getting a few volts in one direction. I replaced that gimbal's motor amplifier with a spare and verified that the gimbal servo was then operating normally. A couple of hours later, I found that the screws that secured a power transistor in the failed gimbal amplifier had not been tightened well enough. Since the transistor's output current flowed through a mounting screw, the intermittent motor drive circuit had been the result of poor assembly. Finding the loose transistor allowed us to say that we had fixed the system's cause of failure. Experience has taught us that although simply replacing a suspected module has become the modern way to troubleshoot military electronics; it may or may not actually fix the problem.

During the ESGM down time of about 45 minutes, the ESGs had continued to reverse every two minutes. This permitted the ESGs to maintain their space-referenced alignment. To get back to the navigation mode, we simply re-stabilized the gimbals and started the computer's alignment process. Although the stable platform had been mechanically aligned to the earth to less than a degree, the precise alignment was obtained through the use of a series of software matrices in the computer. The alignment process (a gyro compass routine) updated coefficients within the coupling matrices so that the alignment was improved over several hours of estimating by the computer. Because our ESGM was a new system, we had not yet made a procedure for at-sea gyrocompass alignment. We started by putting our ESGM into its gyrocompass mode. As the ship moved, the ESGM's latitude and longitude were updated manually every five minutes for three hours using information from SINS.

After three hours, we thought that the ESGM was aligned as well as it was going to be from a gyrocompass operation. We put the system into navigate mode and asked Sperry to reset us a few times over the next day or so. Terry Baglien, who was our man most familiar with the navigation algorithm, was evaluating our ESGM's performance by comparing it to SINS. After the second reset from Sperry, Terry announced that the system was performing well enough and we would not need any additional resets. We were not reset again for the remainder of the trip. Meanwhile, we gathered from their attitude that Honeywell had assumed that our system failure at sea would sink our efforts in the competition. We let them think that.

The weather cleared and we had fairly smooth sailing for the next few days before we would return to Brooklyn and conclude this portion of at-sea testing. We didn't have enough precise information to really analyze our ESGM's performance because Sperry was holding that data close to its chest. However, by comparing the ESGM position output to SINS position, we could see that we were operating reasonably well. At the same time, we wondered how Honeywell's ESGM was doing. They had not encountered any apparent problems during the entire at-sea time. Honeywell personnel seemed to be just biding their time until we returned to Brooklyn and they could go home.

Arrival day at Brooklyn brought lots of anticipation for the Autonetics contingent. We had the coordinates of the pier taped on our computer console where the ESGM latitude and longitude could be read. As the ship moved slowly northward up the East River, the ESGM position outputs got closer and closer to the pier coordinates. Inertial navigators have an inherent tendency to oscillate with an 84-minute period. This is called the Schuler period after Max Schuler who published the concept in 1923. This oscillation can be damped down to nearly zero if an external velocity source such as the ship's log is used. This operation is called "Damped Inertial." However, when leaving and entering port, the ship's log is retracted to avoid its damage by floating debris. During this transitory period, the inertial navigation systems aboard the ship operated in a "Free Inertial" or undamped mode. This allows Schuler oscillation to occur.

Because we had been in Free Inertial mode since entering the East River, the latitude and longitude values were oscillating with an 84-minute period. The ship slowly came to a stop abeam of the pier. Within a few minutes, the ship was pushed to the pier by tug boats. As the ship bumped against the pier, the ESGM latitude and longitude readouts indicated the pier coordinates exactly!

Of course, we were delighted and ran to get as many Sperry and Navy guys as possible to come see the "proof of the pudding." There was no way that the Sperry guys could keep this information confidential. The Navy people were very impressed and proceeded to tell everyone else including the Honeywell guys. After the system had damped the Schuler oscillation to zero velocity, a small offset remained. But it was not significant and did not squelch the hoopla of having zero navigation error when we touched the pier.

Later that day, one of the sailors told us in confidence that the Honeywell ESGM had several miles of error when we arrived at Brooklyn. That large an error is huge for an ESGM, especially for the short number of days that it had been navigating since leaving Florida.

The *USS Compass Island* remained in Brooklyn for the Christmas holiday and most of the Autonetics crew returned to Anaheim for a week or so.

Early in January 1974, the Navy resumed at-sea testing with several trips to the test area in the northern Caribbean.

During an in-port period, a large paint chipping machine called Big Bertha had been set up to clean the rusted surface on the main deck before re-painting. The metallic noise that Big Bertha made during its operation was deafening. Upon hearing it, Terry Baglien ran to the Navigation Center directly below the main deck to check on our ESGM. Unfortunately, he found that both the polar and equatorial gyros were inoperative which required their replacement and calibration. This event reinforced our prior decision that a substantial platform shockmount had to be created to protect the ESGs from structureborne shock and vibration.

We experienced no additional hardware failures during the test program and operation became routine. Honeywell also continued to operate without failures. Still we had no idea how well Honeywell was doing after they had re-calibrated yet again. We suspected that their ESGs were latitude sensitive, as are most gyros. We further conjectured that they had not accounted for this sensitivity well enough in their model and were not compensating for the effect. Meanwhile, our ESGM continued to run well with very small errors compared to SINS.

As March 1, 1974 approached, the contract award announcement was very much anticipated in Anaheim. Finally, word came that the Navy had awarded the ESGM Pre-Production contract for four factory-built systems to Autonetics. We were very gratified. We realized that if the Pre-Production systems proved themselves capable in extensive testing, a follow-on production contract would likely be awarded to Autonetics within a couple of years.

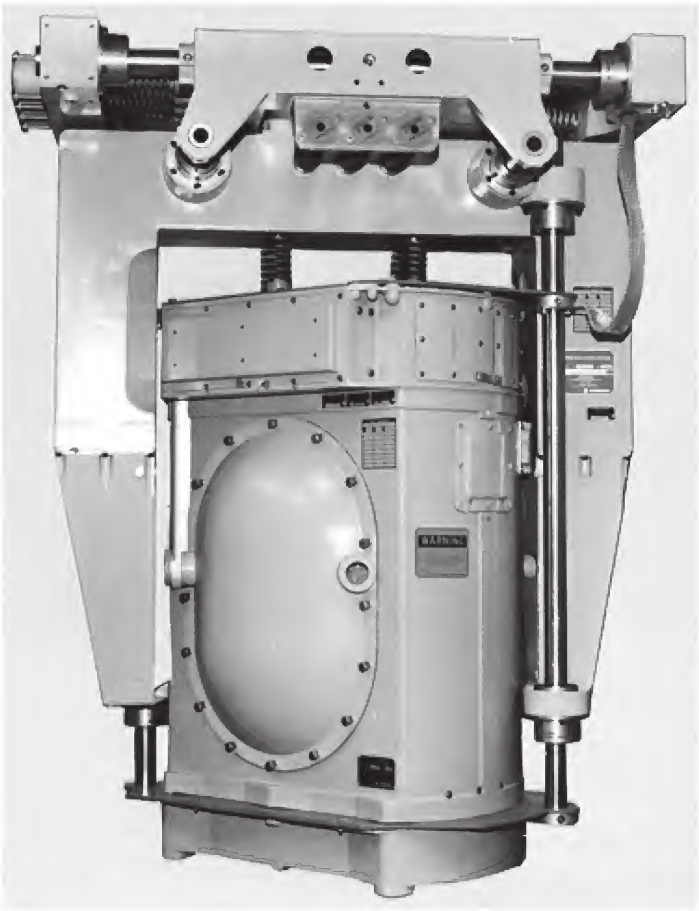
It was not unexpected that Honeywell would protest the ESGM award to Autonetics. The discovery of our ESG's sensitivity to shock at the Brooklyn Navy Shipyard and our servo failure during an at-sea storm probably took away points from our evaluation by the Navy's Source Selection Board. However, it seemed that the Navy was more interested in the long term navigation performance of an ESGM and had concluded that we had produced the better performance.

Honeywell's protest was addressed by the Navy at a meeting in Washington soon after the award. Each company brought test data from ten ESG long-term test runs. Only one of Honeywell's gyros met the needed performance and most of them were clearly underperforming. The Autonetics data indicated that all of its ESGs met the requirement and many of them were much better than the requirement. The Navy judged that Honeywell had not sufficiently developed their ESG for use on an ESGM. Honeywell offered to implement some kind of gyro case rotation scheme, similar to our mechanization, to improve their performance. The Navy's response was that it was too late for Honeywell to re-design their ESG. The Navy decided that the ESGM award to Autonetics would stand as issued.

Epilogue

The pre-production ESGM was designed from scratch using lessons learned from the Demonstration ESGM. Significant work was put into designing a shockmount for the stable platform and housing. The result was a rectilinear device that allowed linear displacement but not rotation of the platform housing. Thus, the roll, pitch and heading output accuracy was maintained. The shockmount springs were chosen to create a natural displacement frequency of 3 Hertz. This design, although cumbersome, was a winner. There has never been another ESG failure caused by external shock events.

In 1975, four ESGM systems were produced in the factory and delivered. The first system was retained at Autonetics as a "house system" to support ongoing testing. The second system went to the Ashore Navigation Center in New York where Sperry would conduct independent testing. The third system went to the *USS Compass Island* for at-sea testing. The fourth system was used for qualification testing that included such environmental exposures as vibration, radiation and humidity. The testing caused several changes to be made to the system design. Re-testing verified that the system was qualified.



The first Pre-Production ESGM Stable Platform and Housing mounted in its protective Shock Isolation System.

In late 1976, Autonetics received a production contract for the first group of ESGM systems. Then, in the mid-1980s, the ESG Monitor was upgraded by the Navy to an ESG Navigator (ESGN) by essentially changing the nameplate.

However, an entirely new ESGN software package was needed to implement the new navigator into the FBM navigation suite. Autonetics provided the new ESGN software and has continued to maintain it as FBM requirements changed.

By the 1990s, two ESGNs had replaced the two aging SINS on every Trident FBM in the fleet. Autonetics, now as Boeing, is still supporting this deterrent force and will continue to do so for many years to come.

About the author: Ralph Guymon started his aerospace career in the Air Force where he worked on fire control and flight control systems for the F-86L, F-102, and F-106. After his discharge in 1960, he joined North American Aviation to work on the SINS Program and began his college studies in Electrical Engineering. He graduated from California State University, Fullerton in 1970. During his 37-year career at North American/Rockwell/ Boeing, Ralph worked in Manufacturing, Program Management and Engineering. He retired in 1997 as manager of Fleet Systems Engineering. Ralph resides in Orange, California with his charming wife, Leila.

The Minuteman I Guidance and Control System Proposal

by Hal Engebretson

Prologue

Fifty years is a long time.

On July 18, 1958 a message was sent by the Air Force Ballistic Missile Office to Autonetics that opened with the words ***"REGARDING YOUR PROPOSAL SUBMITTED IN RESPONSE TO OUR REQUEST FOR PROPOSAL FOR THE GUIDANCE AND CONTROL SYSTEM FOR WS133A MINUTEMAN MISSILE, YOUR PROPOSAL HAS BEEN SELECTED AS BEING THE BEST PROPOSAL RECEIVED."***

Thus ended one of the most intense short-time engineering and management efforts by the then newly formed Autonetics Division. And thus began one of the most successful engineering, production, logistics and management programs in history. What began in 1958 may continue for many more years with the successor Minuteman III program.

Pre-Proposal Preparations

Although the intended USAF development program for a solid rocket engine intercontinental range missile was known to Corporate and Autonetics Management and the marketing people, the program was unknown to most of the engineering departments until the Spring of 1958. Norm Parker has reported to me that he and John Moore, once accompanied by John Slater, made several presentations to Ramo Wooldridge, the firm that was managing Air Force efforts on the program. Within the Autonetics organization, headed by John Moore, the Chief Engineer was Bob Ashby with Norm Parker as his assistant. Three sub-organizations provided inertial guidance, flight control and computer technologies. The guidance section was managed by Fred Eyestone. Within the guidance section there was a sub-section having three groups: Project Engineering, Research and Guidance Analysis. This sub-section, headed by Don Duncan, carried on research on new instrument and electronics technologies as well as providing project engineering support to new research contracts and analytical support to all guidance projects.

The first notice of the Minuteman development effort that came to broad attention within engineering was from a full-page article in the Time Magazine issue for March 10, 1958. This item was brought to the plant by Joe Boltinghouse, a senior engineer in the Research Group who had been developing a new free rotor gyroscope technology. The Time article described the missile concepts and contained, in a statement about critical breakthroughs, "…development at Massachusetts Institute of Technology of a new-type guidance gyro that can be kept running continuously inside the underground slots for as long as two or three years." None of us believed a word of that but we did believe that our new free rotor gyroscope technology could meet those requirements and, therefore, this program was for us! Another new technology was the induction velocity meter developed by Doyle Wilcox in the Research Group. Both the gyroscope and velocity meter technologies had been advanced to formal engineering development as part of the N5B Inertial Navigation System, a technical development project funded by the USAF.

A very intense engineering effort was organized generally under the direction of Dave Chandler, the electronics supervisor in the Research Group. Probably something on the order of fifty engineers gathered together with the objective of writing a proposal to win the program. The largest number came from the guidance organization and a smaller number from the flight control organization. The formal computer organization was not involved since a decision was made to propose a new-technology magnetic-logic computer being developed in the Research Group. Norm Parker has told me that Jesse Bowman was in charge of the overall proposal until he, Norm, returned from a vacation in Italy.

The Air Force Request For Proposal (RFP) was issued in May of 1958. Given the fact that there was no general engineering knowledge of the program until after the Time article of March 10th, one can only marvel at the result of a win decision for Autonetics by July 18th.

The limited pre-proposal activities had defined a system that used the G6 free rotor technology gyroscope, induction velocity meters, a three-axis platform derived from the inner three axes of the N5B platform, a magnetic-logic digital differential analyzer computer, a digital flight control system and a set of digital angular accelerometers for body angular rate measurement. Platform control electronics for the gimbals and the velocity meters were to be based on N5B items in development. Bubble levels, from the N5B program, would be used for the platform level reference and optical azimuth alignment to a silo-fixed autocollimator was defined.

High reliability for a continuous operating primary mode was perhaps the most critical issue. The RFP required continuous operation for only about thirty days and a short reaction time from an off state for the primary mode. We proposed continuous operation as the only mode. Part of the reasoning for this was based on studies of a Bell System Technical Journal item on undersea cable electronics reliability. Another factor was a discussion with people operating the NIKE air-defense missile system. They had found that continuous operation gave them the best results since most of their failures would be on initial turn-on.

The Proposal Madhouse

This was the first very large competitive proposal that any of us in engineering had been involved in. The response time was either thirty or forty-five days. Given our pre-proposal activities including getting people assigned, we were ready to go. We had to read all of the requirements, revise our approaches as needed and produce the outgoing proposal documents. There were a few needed additions to our concepts.

Somewhere in the process, John Moore decided that the proposal should be type set rather than our normal typewritten approach. This created a problem of finding enough outside type-setting organizations. We managed to arrange a fleet of motorcycle drivers to take copy out for type setting and to return finished proofs. Imagine the problem of getting corrections made in a timely manner, and as they say "time is of the essence" in new business proposals. After the first drafts were completed by individual writers, the effort shifted to

our graphics organization for document production. Those of us doing the final editing, proofing and approval almost lived there for a few weeks. If you had a few minutes between sending something out for type setting and taking up proofing of something new, you would just put your head down on the table and go to sleep. John Moore had a couch in his office. At night he would give us the key to his office so that we could use the couch for a nap now and then.

There was, of course, a heavy analysis effort both pre-proposal and during the proposal. A new guidance mechanization was developed based on a functional pitch profile tied in to the velocities. Error analysis for the flight regime was done. This was generally different for the ballistic trajectory compared to the cruise-vehicle mechanizations for earlier programs.

During all of this, there was also a very large effort that went into development of a cost proposal for the research and development program. The R&D program bid included building something approaching forty missiles for test programs.

As proposed, the system included a guidance system designated N10 that included a three-axis platform with DC torque motors and incremental digital angular readouts, two free rotor gas bearing G6 gyroscopes for platform stabilization and a single three-axis VM4 in-block design induction velocity meter and an alignment block carrying mirror surfaces for optical azimuth alignment and a few bubble levels for level reference in a number of platform orientations. The system electronics generally used transformer-coupled AC amplifiers to reduce the need for large capacitors. A magnetic-logic computer called QUAINT (Quantized Integrating Torquer) was designated the D10. The proposed three-stage digital flight control system used two angular accelerometers designated AM1 at the lower end of Stage 2 (for angular rate signals for the Stage 1 and 2 portions of the flight), and the incremental digital readouts from the platform gimbals (for angular rate during Stage 3).

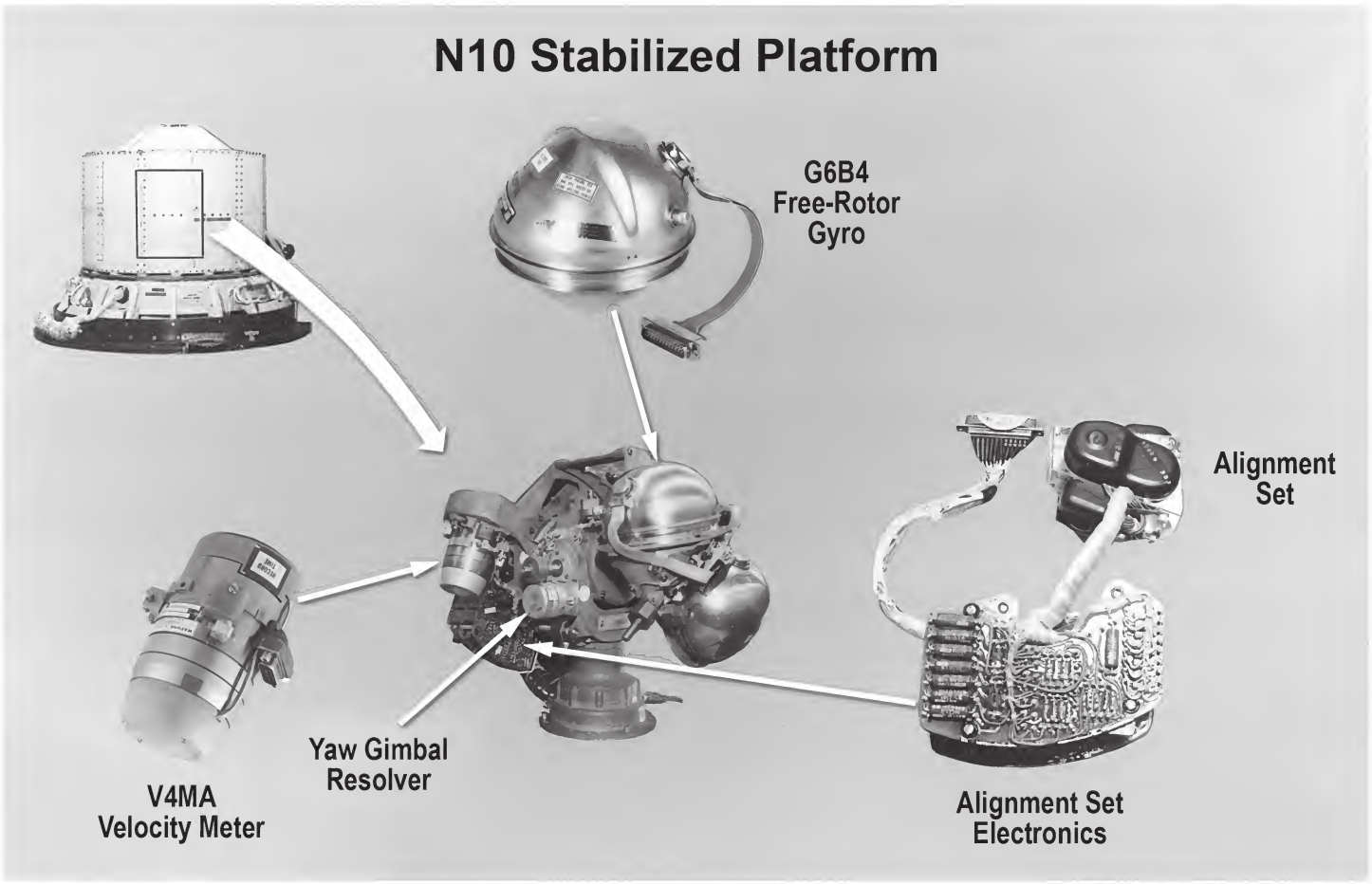
All in all, it was a hectic time.

Proposal Evaluation Phase

First, there were the usual questions from the source selection board.

Then, there was a formal presentation made, presumably by each bidder. Our group included John Moore, Fred Eyestone and several engineers. Norm Parker told me that Bert Holmes made the management presentation and that he made the technical presentation. Bob Knox, the named Chief Scientist for the program also attended. Bob told me that Dutch Kindelberger, Lee Atwood and Dave Chandler were also there.

One important demonstration was made as part of the presentation. The inner three axes of an N5B navigation system gimbal set, having two G6 free rotor gyroscopes and three VM-1 velocity meters was taken to the meeting. It was set up with the inner axis as a pitch axis as had been proposed for the missile. An electronics box of N5B hardware was also taken. The demonstration was set up so that throwing a single switch would start up the instruments and gimbal servos and the platform would stabilize. It made quite an impression.



Boeing File Photo

A component breakdown of the Minuteman I production version of the N10 Stabilized Platform

One other matter came up that is probably not well known. Sometime during the source-selection process John Moore received some information that the program was at risk due to a possible shortcoming in the specific impulse for the solid rocket boosters. Autonetics had proposed a system weight that was well below the specification maximum. John realized that with this lower weight, the specific impulse for the boosters could be lower and still achieve the specified range. He called someone in the Guidance Section, probably Fred Eyestone, and wanted an expert in the analysis of rockets sent to his office. Somehow that assignment fell to me as one who had done a lot of work on the proposal.

All that I knew about rocket propulsion was what I had recently learned in a UCLA extension class in dynamics taught by George Kachikas. I rounded up George and we took the bus across Imperial Highway to John's office. In discussing the matter during the ride, George seemed to have forgotten what he had taught so I tried to tell him what I had learned from him. Arriving at John's office, George and I spent the next four hours with John doing various line integrals of thrust and drag for various assumed specific impulse and final stage weight values. We did conclude that with the lower weight that we had proposed a significantly lower specific impulse rocket performance could still achieve the required range. All that I remember about that furious afternoon of calculating was that someone had about a 2-foot slide rule that we used to get numbers. During the entire time there were no interruptions, phone calls or other disturbances. At the end of the day John was happy and George and I went back to Building 6.



U.S. Air Force photo

Air Force missile maintenance crewmen perform an electrical check on a Minuteman II intercontinental ballistic missile (ICBM) in its silo.

In mid-July a rumor came from somewhere that AC Sparkplug (later known as AC Electronics and then Delco), a known bidder, had been selected. Some of us, Dick Ramont, Art Pfeiffer and I, went fishing for several days. When we got back we found out that Autonetics had won.

A Partial List Of Players

Management people included John Moore, Norm Parker, Fred Eyestone, Don Duncan, Tom Shuler, Jesse Bowman, and Bert Holmes.

Engineering people included Joe Boltinghouse and Stan Cogan for gyroscopes; Doyle Wilcox and Virgil Sims for velocity meters; T. Mitsutomi for electronic circuits and Dick Ramont and Art Pfeiffer for the computer; George Kachikas, Stan Ausman, Ted Fine, Bob Doty, and possibly John Pinson for analysis; Al Kreuger for reliability; and Elliot Buxton, Dan Simpkins, and Mal Johnson for flight control. Dave Chandler provided general technical direction for engineering.

Why Did We Win?

We offered a believable continuous-operation system based on the G6 free rotor gas bearing gyroscopes and the induction velocity meters. Significant test results were available on each of these technologies. We offered a digital flight control system. One of the evaluators told me after the award that they were tired of climbing up the side of an Atlas missile before any launch to make changes or adjustments to the flight control system.

We also offered a new and superior flight mechanization based on the programmed pitch profile approach, a low proposed weight, and a believable high-reliability system. Most of this contained in the proposal came from the instruments and the simple electronics and computer. After award, the computer approach was changed to a conventional electronics design but this increased vastly the parts count and lead to the High Reliability Parts Program, that was not initially proposed.

And, most importantly, the hard work of a lot of good and dedicated people.

Hal joined NAA in 1954, working on flight test instrumentation, electronics research, numerical control systems and some new-business efforts including the Minuteman I proposal and initial system engineering. He left in 1959 but returned in 1961. He was then involved in management efforts including system engineering, advance projects, the N16 navigation system, inertial instrument engineering and the proposal efforts for electrostatic gyroscope systems for strategic and tactical submarines. He retired in 1981 from Strategic Systems Division. He maintains a consulting business related to inertial technology for the oil industry. He shares his time between Yorba Linda, California and Longbranch, Washington with his charming wife Jackie.

Taming The Savage

by Jim Pearce

Author's Comment: In the Fall 2007 issue of the Bulletin, Ed Rusinek wrote a much needed article about a very unusual NAA aircraft which had received very little publicity during its Navy service. It was the AJ-1, named "Savage" *by the Navy, conceived near the end of World War II, initially built in Inglewood as the XAJ-1 and first flown in 1948. Although, Ed's description of the Savage was accurate, it contained no information about the airplane as seen through the eyes of the guys that flew and tested this bird. I was one of those guys and here is my story…*

How the Navy ever came about naming this unusual competitor to the USAAF atom bomb carrying B-29, the *"Savage"*, before it ever flew, amazes me to this day. Bob Chilton, known for his extensive flight testing of the P-51, made the first twelve flights of XAJ-1 No. One. After completion of Flight 12, Bob got out of the cockpit, sauntered over to the dual right landing gear, urinated on the tires and quit test flying. One test pilot gone from Ed Virgin's roster of engineering test pilots.

Then XAJ-1 No. Two came out the door and was instrumented to commence its test program. Its crew consisted of Al Conover, whom I met at the Navy Test Center at Patuxant River when he demonstrated the XFJ-1 Fury and I, as a Navy test pilot, was his chase pilot, and Chuck Brown, a USAAF test pilot recently hired by NAA. Al and Chuck were performing a structural test over the Pacific when, during a high rudder load sideslip, the plane's tail twisted off causing the loss of the aircraft and both pilots. This, along with the loss of Krebs and Pickard during a B-45 test flight placed a serious dent in the engineering test pilots roster.

In mid-1948, I had decided to leave the Navy and applied for a testing job with Ed Virgin, who I came to know when I was the Navy chief test pilot at Patuxant on the FJ-1. Ed was very kind, but he said he had all the test pilots he needed, so the answer was a "No". Shortly thereafter, I got a testing job with Grumman. I was only at Grumman a few months when I received a call, through my Grumman management, from Ed Virgin inviting me out to LA for an interview. I went and found out how bad things were with the engineering test pilot staff. It was down to "Wheaties" Welch and Joe Lynch and both were drawing straws to see who could AVOID flying the remaining XAJ-1.

I had always looked at NAA as the "King of the Fighter Builders" and saw the possibility of flying the F-86 which had beaten the X-1 in the race for supersonic flight and, although I was afraid I was going to be Mr. XAJ-1 project pilot, I took the job. It also raised my salary from $525 to $825 per month.

A couple of days after I joined NAA, Joe Lynch drew the short straw and became my checkout pilot flying XAJ-1 No. One. We flew a Navion to Edwards, North Base and Joe ran me quickly through the cockpit checkout, which wasn't very informative, since he was sitting in the left (pilot's) seat and blocked out most of the switches and knobs he was talking about. He then started the two reciprocating engines and taxied out onto the North Base runway.

Joe then pushed the two recip throttles up to full power and off we went with me in the controlless right seat. As the gear was retracting, one of the engines began surging between minimum and maximum RPM. Joe started stabbing circuit breakers on the panel to his left, attempting to find the one controlling the prop synchronization system. Seemed like he couldn't find it, so he shut down the right engine and feathered the prop. However, he apparently did find the communication system circuit breaker because all talking stopped. All this happened before we reached 500 feet.

At this point, we were over the Lake Bed and Joe decided to land. He lowered the gear and then lowered the flaps. When the flaps came down, so did the nose of the aircraft. We were diving at the Lake Bed and, Joe, built like a gorilla, was tugging at the stick with all his might! It looked to me like we were going to make a hole in the Lake Bed so I unstrapped myself from my seat and moved over to help Joe try to pull the nose up. My efforts were only somewhat effective but enough to enable the plane to strike the sand nose wheel first instead of radome first. The plane survived this "semi-crash" and Joe started the right engine and taxied the plane back over the Lake Bed to the North Base, shut down the engines, took off his now soundless helmet and said, "You are now checked out. Good luck with this beast." I later found out that the longitudinal electrical trim tab circuit breaker had been pulled during the frantic circuit breaker punching episode.

Fortunately, Bob Chilton, while not flying anymore, was the Flight Test Engineer on the XAJ-1 test program. He was a lifesaver in familiarizing me with all the new and unique automatic systems which were designed to make this big aircraft fly like a fighter. Soon, I found out that, without its 10,000-pound atomic bomb simulator and with its jet engine fired up, the airplane could fly like a fighter as long as all the automatic and power assistance equipment functioned correctly. Its throttles were on the left, it had a stick instead of a wheel to control it and was a joy to fly.

On occasion, I was required to do a little airshow with it to impress some Navy brass or politicos that Dutch had invited to the plant. Back then, when NAA wanted to show off one of its new aircraft, permission was easily obtained from the LAX control tower who would work us in between the airliner traffic. My little show was very simple and short but attention getting because of the size of the Savage. First, I would start a shallow dive over Northrop field with all three engines at full power, cross the LAX boundary at 500 feet and about 400 knots, pull up to the vertical in front of our Flight Test hangar, half roll and come out on the same heading as when I entered the maneuver, roll right side up and then make a slow 80 knot pass over the heads of the spectators at about 500 feet. Flying was fun in those days!

During the 14 months of testing the XAJ-1 before the aircraft was flown to NATC, Patuxent, to perform the Structural and Flying Qualities demonstrations, much of the testing involved checking out modifications to the design of the airplane. Most of these mods were dictated by the Navy in response to their objections about what happened to the fighter-like flight characteristics of the airplane when any of the many automatic or high-pressure control boost systems failed. As we progressed through these changes; we were essentially, little by little, trading away the fighter-like characteristics of the design and making it into the bomber that it really was. These changes did, however, make the plane easier to handle under conditions where some of the automatic features quit working. Eventually, the plane became a bomber with throttles in the center of the instrument panel and a wheel instead of a stick to control its maneuvers. Also, it should be noted that among the changes made to the design was the removal of the marked dihedral of the horizontal stabilizers. It had been determined that the dihedral had contributed to Al Conover's and Chuck Brown's fatal accident, as well as a near fatal out-of-control situation I got into during a high speed rolling pull out maneuver at the NATC demonstration.

During its service in the Navy, the Savage did a lot of flying from aircraft carriers. However, in the eyes of the carrier crews, they were never great to have aboard. They were so huge that they impacted the flight deck operations of the straight deck carriers they flew from and in order to stow them on the hangar deck it was necessary for crew members to climb up on the wings and horizontal stabilizers to install the equipment needed to



fold up the outer wings and fold down the vertical tails so that they would fit into the hangar deck. The Savage fleet was retired in 1960 and its duties taken over by the solely jet-powered Douglas A-3 Skywarrior.

About the author: Jim joined LAD in March 1950 as an engineering test pilot and was transferred to the new Columbus Division in September 1951 as Chief Engineering Test Pilot and Manager of Engineering Flight Test. He remained at Columbus until November 1961 when he transferred to the S&ID Division at KSC as Director of Test and Operations for the Apollo Command and Service Modules. He left NAA after the Apollo I fire and was very successful in several business ventures of his own. His entire life is covered in a recent inspirational autobiography "A 20th Century Guy". *Jim currently resides in Puerto Rico.*

BOOK REVIEW

A 20TH CENTURY GUY

by Jim Pearce

If you enjoyed the ***Taming of the Savage*** article in this issue, you will enjoy Jim's entire life story from childhood in Detroit to a busy retirement in Puerto Rico. This book has a lot of flying and a lot of living! This is a story of a man that was given more than his share of life's burdens and managed to overcome them all, not in anger, but in accomplishment. Your price for this little gem is only $20.00 which includes shipping. It's a great Christmas gift idea! Order from:

SSA Publishers
P.O. Box 5488
Goodyear, Arizona 85338



End of an Era: Boeing Disposes of Shuttle Equipment, Buildings

Editor's note: This story was circulated on the Internet recently. In the interest of passing along news of North American Aviation and its legacy companies, we have reprinted the article for our readers.

A six-story maintenance work stand used by Boeing workers in Palmdale for building and repairing the Space Shuttle was demolished July 14th as efforts continue to dispose of surplus equipment and facilities.

The maintenance stand, called the Space Shuttle Orbiter Aft "513" Work Stand, was moved from its long-time residency within Bay Two of the Orbiter Hangar in Building 150 to an outside area for destruction. The number 513 refers to the part number.

"The demolition of such a large, nearly iconic, piece of Orbiter build and modifications history sends the message that we are moving towards retiring the Space Shuttle and related facilities and equipment," said Al Hoffman, Boeing director of proprietary operations for Palmdale/Edwards Air Force Base. "It's a bit sad to many of us here to see this work stand go to scrap, but everyone remains focused on flying our final mission safer than those preceding."

Although the stand had wheels on it so it could be moved in and wrap around the back end of the shuttle orbiter, it was so large that it could not be economically transported to Kennedy Space Center.

Through its heritage element, Rockwell International, the Boeing Company developed and built five space shuttle orbiters: *Atlantis, Challenger, Columbia, Discovery,* and *Endeavour*. Palmdale performed the initial assembly and checkout of the orbiters as well as the Enterprise approach and landing test vehicle.

Palmdale was the center of shuttle activities where Orbiter Maintenance Modifications (OMM) and post-flight inspections, repairs and modifications called Orbiter Maintenance Down Period (OMDP) were accomplished from 1985 to 2001. Palmdale employed as many as 1,800 people in the 1980s to assemble the orbiters. After building the orbiters, the work force drew down to approximately 650 supporting OMM and OMPD. Today, Boeing has a workforce of about 80 people.

Most of the work was transferred to Kennedy Space Center when United Space Alliance was formed, a joint venture between Boeing and Lockheed Martin.

Bob Kahl, Boeing director of Orbiter Operations Support at Palmdale, helped build the 513 stand and served his entire career at Palmdale since March 1975. He spent a good amount of time on the maintenance stand and remembers, "There were periods when we worked seven days a week for a couple of years straight and we had only one day off and that was Christmas."

The Boeing Palmdale work force continues to support the space shuttle program by building and repairing cold plates, which are finned devices used to cool electronic components on the space shuttle. They provide logistics support for parts, quick turnaround repairs and manufacture thermal protection tiles for test. They also support the External Tank quick disconnect valves on the orbiter when needed, which they used to manufacture locally.

Approximately 1.4 million pounds of original manufacturing and assembly tooling stored at Palmdale has been destroyed. Palmdale collected the original industrial build tooling equipment used at the Downey location as well as at the support contractors. NASA maintains a federal excess property database that catalogs the space shuttle assets. Those assets are available to everyone in NASA as well as other government agencies and museums.

"NASA was mandated to keep this equipment in storage in the event that we ever had to build another space shuttle orbiter. When the new space exploration policy announcing the retirement of the space shuttles in 2010 came out, we worked with NASA to put together a plan to get these assets disposed of," said Hoffman. "Unless you were building another orbiter, most of this equipment would have no use."

"We've disposed of a lot of equipment so far, we still have the interior of the Building 150 hangar to do, that includes the center work stands and equipment attached to the building. We are about 75 percent complete in disposing of the major structure build-up tooling," said Kahl.

One item that has found a new home with the city of Palmdale was the Shuttle Escape System Test Vehicle capsule. The capsule was a simulator with two hatches on top that were blown off as part of a heavy-duty aircraft ejection system for the commander and pilot. The test vehicle rode down a rocket sled. Space Shuttle *Columbia* included this ejection system for the first few missions, but it was later removed.

In addition, six temporary support buildings were torn down and another two warehouses are slated for demolition next year. Two facilities torn down this month included Building 162, which once housed the engineering offices, and Building 122, which contained the Orbiter Lift Facility operations and was once the avionics testing control center supporting the B-1B bomber program.

"The facilities were not in the greatest shape because of their use for 30 plus years. As we downsized, we moved our people from the outlying buildings into the main hangar, Building 150," said Hoffman. "By eliminating these temporary buildings, we are on our way to restoring the site so it can be reconfigured when the Air Force takes it back."

The Orbiter Lifting Fixture, which was used to lift the space shuttle orbiter onto the Boeing 747 for a flight back to Kennedy Space Center, will be also disposed of in the future. Boeing is working with NASA to find a future home for this large piece of equipment.

A NASA historical artifacts team and their contractor, Archealogical Consultants, have surveyed the Palmdale facilities and equipment. Building 150 where the space shuttles were assembled and repaired and the Orbiter Lifting Fixture are being considered for listing in the National or State Register of Historic Places.

"I'm here until they tell me they don't need me anymore." Kahl said. "Very few people have a passion for the shuttle like us space cadets do. It is still rewarding to be part of it and I still look forward to supporting launch operations. We all want to ride it out to the very end."

The Boeing facilities are located on an area called Site One on the U.S. Air Force Plant 42, which is adjacent to Edwards Air Force Base, California.

Contrails From The Past

by Ed Rusinek

Dear Ed,

I read the Exporting Airplanes article in the Fall Issue with great interest, particularly with reference to the Douglas "…units of the ill-fated DB-7, later designated the A-20."

First of all, the DB-7 was never ill-fated. It was very successful. The ill-fated model was the Northrop 7-B light attack bomber. It was one of a kind and was part of the package that Douglas purchased from Northrop with the factory on the south side of Imperial Highway, the newly designated El Segundo Division of the Douglas Aircraft Co.

In 1938, I was working there on the templates for the new DB-7 bomber. The template department was located on the top floor and the windows gave us a good view of the NAA factory across the highway.

In January 1939, test pilot Johnny Cable was demonstrating the flight capabilities of the 7-B to a representative of the French Air Force at lunchtime. I was eating lunch in my car and got outside to get a better view of the aerobatics of the flight. Johnny made a power dive on the runway at Mines Field from the East and went streaking past at low level at a reported 350 mph.

My lunch hour was over, so I went back to my department and noticed my co-workers looking out the windows. I went to see what was happening. Just as I looked out, the 7-B was directly overhead, flying low with one engine shut down to demonstrate single-engine capability. It was heading North, and just as it was over the NAA parking lot, the pilot pulled up into a vertical corkscrew climb. The 7-B reached an altitude of about 700 feet and stalled out. The plane started down into a steep tailspin for about two turns when I saw something dark leave the airplane. It was the pilot, Cable, bailing out. The loss of his weight up forward caused a shift in C.G. and the plane went into a flat spin with one engine still roaring!

The flat spin caused the plane to lose vertical speed and to just mush in atop the cars in the NAA parking lot. Five cars were flattened, the roaring engine stopped abruptly and the released fuel caught on fire at the forward end of the airplane.

NAA workers rushed over to the rear of the airplane and pushed against the leading edge of the horizontal stabilizer. Since the fuselage broke at midship where the turret was located, they managed to move it enough to drag the Frenchman out of the turret. He only suffered a broken ankle. The pilot was less fortunate. His pilot chute had just pulled out the main chute when he hit the pavement and was killed.

All my life I had wondered how I would feel to witness an airplane crash. In this case, I got very sick to my stomach and I never wanted to see another crash.

—Douglas Alkire, Monterey Park, CA

Ed's Ans.: Doug, almost after every issue, you come up with a related anecdote. We love them all and look forward to them!

Dear Ed,

I enjoyed the article, Dutch Kindelberger's Columbus Gamble, in the Fall 2008 issue. However, there was no mention of events that followed after NAA moved out of the facility. McDonnell Douglas took over the site but in the early 1990s decided to dispose of the highly advanced machining equipment and close the plant. Consequently, the United States Government returned a 16-count indictment setting criminal charges against McDonnell Douglas and the China National Aero Technology Import and Export Corporation, a government-formed corporation in Beijing, China, for making false and misleading statements in the exportation of thirteen pieces of sophisticated machining equipment used to build aircraft parts. According to the indictment, 6 of the 13 pieces of machinery were diverted to an unauthorized factory in Nanchang, People's Republic of China.

—Frank M. Peltson, Las Vegas, NV

Ed's Ans.: I am shocked, shocked! Is there no honor, not even at the highest levels of management?

Dear Ed,

For many years, I served on the Board of the Central Ohio Chapter of the Association for Computing Machinery (ACM). Each year we donated money for a scholarship in Computer Science at Ohio State University. The recipient was selected by a committee from the Engineering Department on the basis of "lack or inadequacy of other aid." While our check was sent to the department, it was made out to the Ohio State University Foundation.

I am sure the "North American Aviation, Inc. Scholarship Fund" can make similar arrangements through the Aeronautical Engineering Department at USC. There may already be a foundation that would be available to manage an endowment fund created by NAA retirees, so that we would have no need to set up a separate trust.

—Otto C. Juelich, Columbus, OH

Ed's Ans.: Thank you for the suggestion. Our Stan Guzy is going to explore all possibilities.

Dear Ed,

You invited comments on a proposed North American Aviation Scholarship Fund. We, at NAA, came from many universities, states and countries. We worked in a variety of fields at diverse facilities, many not even in Los Angeles, as epitomized by your articles on Columbus, KSC and other locales. Picking one local university may not be the best approach. An alternative might be to establish a NAA scholarship for children of Boeing employees. Rockwell used to provide scholarships for children of employees. If Boeing has a similar program, maybe they would be willing to do the administrative work for the NAA fund along with their own.

Alternatively, if the idea is to memorialize NAA at a specific local university, then endowing a Professorial Chair is a more visible way to do it. Considering a smaller college in the El Segundo area like Loyola, Chapman, El Camino, or Santa Monica might serve this purpose better.

—Steve Evans, Foothill Ranch, CA

Ed's Ans.: Thank you, Steve. Your ideas are certainly worth exploring. With the years passing, there are very few employees at Boeing that came from the original NAA organization that still have children of college age.

I suspect to endow a chair at the university would be somewhat higher expenditure than we could afford, but we still have to approach the universities in the Los Angeles basin to see if any of them are interested in our scholarship idea.

Congratulations and Best Wishes to

Howard and Estelle Wilkerson of Sedona, Arizona
celebrating their 66th Wedding Anniversary

Joe and Betty Onesty of Seal Beach, California
celebrating their 63rd Wedding Anniversary

William and Margaret Hurd of Vacaville, California
celebrating their 60th Anniversary

Walter and Patricia Kuhn of Sun City, California
celebrating their 60th Anniversary

Arden and Agnes Fjelsted of Lancaster, California
celebrating their 59th Wedding Anniversary

John and Vivian Andres of Seymour,Tennessee
celebrating their 55th Wedding Anniversary

Howard and Dona Cox of Hacienda Heights, California
celebrating their 55th Wedding Anniversary

Edmund and Krystyna Rusinek of Rossmoor, California
celebrating their 55th Wedding Anniversary

Richard and Joann Sebek of Chino Hills, California
celebrating their 55th Wedding Anniversary

Tommy and Estella Tijerina of San Antonio, Texas
celebrating their 55th Wedding Anniversary

Joe and Maureen Collins of Anaheim, California
celebrating their 54th Wedding Anniversary

Victor and Mary McLaughlin of Santa Maria, California
celebrating their 37th Wedding Anniversary

The Silent Majority

by Stan Guzy

ALDRED, ALFRED H. "BUNKY", 77 – of Nolensville, TN died on September 27, 2008. He retired from Rocketdyne after 35 years of service as a rocket scientist and test engineer. His assignments included Huntsville, AL; White Sands, NM; Kennedy Space Center, FL; Stennis, MS and several locations in California. He is survived by his loving and devoted wife Patricia.

ANDREWS, EDWARD, 79 – passed away on August 18, 2008 in Los Angeles, CA. Edward served for 22 years at LAD as a janitor. He is survived by his son Eric.

ARBIT, HARRY A., 88 – reported to have died in June 2008 from undisclosed causes. Harry was born in Russia in 1920, came to the United States and moved to Los Angeles in 1948. A graduate of the University of Chicago, he held four U.S. patents and was the recipient of many professional awards and commendations for his work on the Apollo and Space Shuttle programs. He retired from NAA/RI Rocketdyne in 1995. He was widowed in 2005.

BELL, HAROLD W., 90 – of Issaquah, WA, died on March 2, 2008. During his Naval ROTC summer cruise in 1937, Harold served aboard the battleship *USS Colorado* during an extensive search in the Central Pacific for Amelia Earhart. He graduated with honors in 1939 from the University of California at Berkeley in 1939. During WWII, he was assigned to the Bureau of Astronautics in Washington D.C. His career at Downey started with Vultee and went through Rockwell. He was Chief of Aerodynamics for the Apollo program and Director of the Space Sciences Lab. At the Seal Beach facility, he was a prominent member in the design of the Beaver underwater research submersible. He served 32 years at NAA, retiring in 1981. He is survived by his loving wife Helen.

BOTELLO, HELEN, 83 – expired peacefully on October 12, 2008 from undisclosed causes with her children and her husband of 64 years at her bedside in Sun City, CA. During her adult years she lived in Downey, CA where she worked for NAA/RI for over 25 years as an inspector on many space programs.

BREAKER, CHARLES, 88 – passed away on September 30, 2008 in Redondo Beach, CA as a result of prostate cancer. He was a tool designer at LAD when he retired in 1980. He is survived by his wife Ida.

BURKE, JOSEPH F., 81 – a resident of Costa Mesa, CA, passed away from undetermined causes earlier in 2008 at the home of his daughter. A man of many interests, he spent most of his career with NAA/RI working on the Saturn and Shuttle programs. His wife, Mary, preceded him in death.

CASSADY, LARRY C., 70 – a resident of Henderson, NV, died on September 1, 2008 from undisclosed causes. Larry retired from NAA/RI and is survived by his wife Janet.

CLARK, GEORGE M., – died of cancer on June 7, 2008 in Canoga Park, CA. During his 34 years of service, George worked at Rocketdyne, Rockwell B-1 Division, and the Boeing Phantom Works. He retired in 2002 and was working on an MS degree in geology while teaching part time at CSU Northridge when he passed away. He is survived by his wife of 38 years, Kathy.

CONFER, STANLEY G., 77 – of Fullerton, CA passed away on September 14, 2008 after a brief battle with lung cancer. In his 30 years of service at LAD, Stan worked on many projects and retired from the engineering Ground Support Group (GSE). Stan's wife Earlene joined him in eternal peace on October 28, 2008.

DAILEY, JAMES R., 75 – passed away on September 16, 2008 in St. George, UT. Jim joined NAA as an instrumentation engineer and served at LAD, Collins, Atomics International, Space, and the B-1 Divisions. He retired as manager of instrumentation engineering on the B-1 in 1988 with 34 years of service.

DAVIS, KENNETH L., 93 – of Mission Viejo, CA passed away on November 13, 2007. Joining LAD during World War II in 1942, Ken was a test engineer on the P-51. Later, he transferred to Downey and retired in 1977 with 35 years of service. He is survived by his loving wife of 71 years, Genevieve.

DE LONG, MARY M., 92 – of Fullerton, CA passed away in October 2008 from various ailments primarily associated with aging. Records indicate she retired from NAA in 1984 after 25 years of service. She served as office administrator for the Director of Advanced Systems Engineering.

DOOLEY, WILLIAM T., – the "Reminder" card returned indicating that he passed away on March 12, 2006 from Alzheimer's complications. Records indicate Bill retired from NAA Los Angeles Division in 1978 after 30 years of service.

EDWARDS, NORMAN "NORM", 73 – of San Clemente, CA passed away on October 31, 2008 of complications due to COPD. Norm retired in 1989 after serving 38 years at Autonetics, the Mississippi Test Facility, Saturn II, and at Space Division on the Space Shuttle. He is survived by his devoted wife, Jean.

GOMME, GERALD E., – reported to have died in November 2007 with no further information made available. Our records indicate he retired from NAA/RI Rocketdyne in 1978 after 24 years of service.

GURLEY, EDWIN J. "TED", – passed away on April 20, 2006 after a valiant battle with cancer. He retired from the Autonetics Division in 1989 after 27 years of service. His wife of 42 years, Charlene, survives him.

HANSEN, MARY B., 85 – passed away in Rancho Palos Verde, CA on September 4, 2008 after a long illness. Mary served in the Art Department at LAD for 30 years before retiring in 1980. She is survived by her husband of 52 years, Victor, who also is an Autonetics retiree.

HEGG, RUTH E., 80 – of Hemet, CA passed away on September 18, 2008. Ruth obtained her BA degree while working at North American. She rose to the position of executive secretary during the last eight years of service prior to her retirement in 1991. She received recognition for her service including the coveted NASA Astronaut "Snoopy" Award. She is survived by her husband, Donald, who also served at NAA.

KAYS, FRANCES P., 96 – bulletin returned marked "Deceased". Records indicate she lived in Inglewood, CA and retired from NAA in 1967 after 17 years of service as a PBX operator at LAD and Palmdale.

LADEWIG, ROBERT, 89 – passed away on August 29, 2008 at his home in Hemet, CA. After obtaining a degree in electrical engineering, he was employed by NAA for several years. After retirement, he moved to Hemet, CA with his wife of 58 years, Rita.

McWHINNEY, WILLIAM J. "BILL", 78 – of Las Vegas, NV, died from complications after bypass surgery on August 20, 2008. Bill was an electrical engineer who worked on the B-70, B-1A, B-1B, and supported the 757 program while on loan to Boeing. He was proud of his accomplishments on the B-1A capsule testing project at the Downey test pool. He is survived by his wife Beverly, also a NAA retiree.

MUMEY, MAURICE L., – the "Reminder" card returned by Janice Mumey, reporting the death of husband on September 19, 2006.

MURPHY, GEORGE T., 80 – passed away at home in La Quinta, CA on his 80th birthday on August 13, 2008. George retired from Rocketdyne in 1984 after 25 years of service. He is survived by his loving wife Beverly and their eight children.

NELSON, STEPHEN H., – passed away September 3, 2008 from congestive heart failure. He started his career with NAA at the LA Division in 1947 after serving in the Air Force. He worked for Dutch Kindleberger, Ralph Ruud, and Kenny Gay for several years in the Material Department. He transferred to the Autonetics Division and later to Space Division where he became Division Director of Materials and Major Subcontracting for the Apollo, Saturn, Space Station, and Shuttle programs. He retired in 1984. He leaves his wife of 41 years, Donna, and an extended family.

PARKER, JACK P., 76 – passed on September 7, 2008 of cancer. Jack's career spanned many programs including Apollo and the Space Shuttle. He retired from the Space Division in 1996 after 37 years of service. Jack is survived by his wife, Jodi.

PENDELTON, FRANCES "FRANKIE", – passed away on April 27, 2008 at home in Whittier, CA from complications as a result of a stroke. She retired in 1989 from Downey where she served for many years in Manufacturing. She is survived by daughter, Vicki, and son, Phillip.

SOTO, ALBERT, 88 – a resident of Placentia, CA died from Alzheimer's disease on September 8, 2008. Albert worked in the system area including the fuel gauging system of the T-28, the B-1 bomber, and the 2nd stage of the Apollo rocket. He is survived by his wife of 57 years Julieta.

STEWART, JOSHUA E., 82 – went to his reward on September 9, 2008 from undisclosed causes. Joshua moved to Arizona with his wife, Phyllis, in 1990 after retiring from NAA/RI.

SWENSON, MERRILL E., 86 – passed away October 23, 2008 due to kidney failure. A graduate of UCLA, he worked in the finance area at NAA/RI/Boeing. He is survived by his wife of 63 years, Margie.

TKACH, BERNIE, 78 – died in Las Vegas, NV on September 17, 2008. Bernie began his NAA career at the Autonetics Data Systems Division in Downey, CA. He retired from Strategic Systems at Anaheim in 1989 after 34 years of service. He is survived by his wife of 48 years, Ginny.

TURNER, GAYLE L., – the "Reminder" card returned stamped "Deceased" indicating death on January 1, 2007. Records indicate Gayle retired from NAA/RI in 1995 after 35 years of service.

WHITE, VERNON E. "NORM", 82 – passed away suddenly of a heart attack on July 13, 2008 in Carpenteria, CA. Norm was the Human Resources Manager at Rocketdyne for 33 years. He is survived by his wife of 59 years, Michi. She also worked at Rocketdyne.

WYKES, ROBERT C. "BOB", 77 – passed away of cancer in Alpharetta, GA on June 10, 2008. Bob retired from Missile Division in 1986 after 33 years of service.



LOST SHEEP – BULLETIN RETURNED, NO FORWARDING ADDRESS
THOMAS R. CRAVETS – SAN ANTONIO, TX
EDWIN B. GANGEL – GRANTS PASS, OR

A Word from Stan: Of the 34 names added above to the Silent Majority, only 16 were subscribers to the Retirees Bulletin. For the others, their only connection to the Bulletin is this mention in the Silent Majority. When we add a name to this final salute to our fellow retirees, we make no distinction as to whether it is that of a subscriber or not. All retirees, in death as in life, are important to us. However, there is a certain irony in doing so because the family will never see the name of the loved one since the Bulletin is sent only to subscribers. In this holiday season, why not check with your friends and if they are not subscribers, give them a gift subscription. Have them participate in the Bulletin on a "lively" happy note rather than a sad final one!

NORTH AMERICAN AVIATION
RETIREES BULLETIN
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Photo from the Lawrence J. Hickey Collection

On April 6, 1945, B-25s from the 499th Squadron attacked a Japanese frigate near Quemoy Island off the China coast. 2LT Francis A. Thompson is seen pulling up just after passing over the stern of the warship. Moments after this photo was taken, a bomb dropped by the flight leader, 2LT Lester W. Morton, exploded against the starboard side of the ship.

NORTH AMERICAN AVIATION
Retirees Bulletin

Spring 2009

Inside:

THE ALLISON-ENGINED MUSTANG by Christopher Shores
THE UNITED STATES AIR FORCE ACADEMY AND NORTH AMERICAN AVIATION

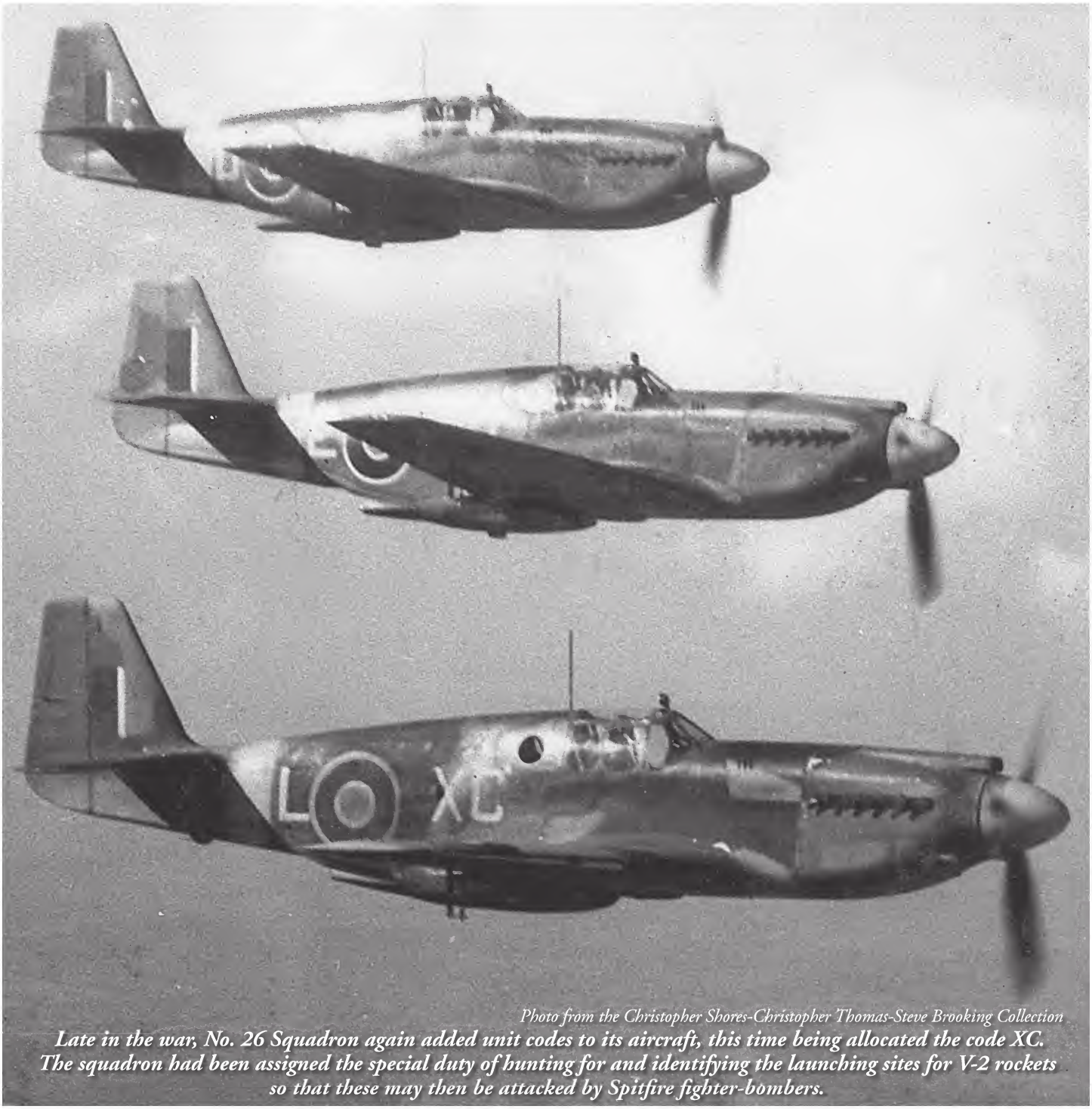


Photo from the Christopher Shores-Christopher Thomas-Steve Brooking Collection

Late in the war, No. 26 Squadron again added unit codes to its aircraft, this time being allocated the code XC. The squadron had been assigned the special duty of hunting for and identifying the launching sites for V-2 rockets so that these may then be attacked by Spitfire fighter-bombers.

NORTH AMERICAN AVIATION
Retirees Bulletin

North American Aviation Retirees Bulletin, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAAR Bulletin can be contacted at The Boeing Company, Seal Beach facility by phone at (562) 797-3836. Send mail to:

North American Aviation Retirees Bulletin
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Seal Beach, CA 90740

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Yes, I am a retiree of NAA/Rockwell/Boeing and I want to subscribe to the NAA Retirees Bulletin. I am enclosing a check payable to the Bald Eagles, Inc. for $_____. For every $10.00 I will receive four issues per year. For $100.00, I can become a Silver Eagle with subscription for life.

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Dear NAA Retirees Bulletin Subscriber

Once again, your NAA Retirees Bulletin staff has reached ever greater depth to find you, our readers, the best in reports about North American Aviation accomplishments and machines and the people that made them and flew them. Twenty some years ago, I saved a British Aviation Quarterly magazine with an article about the original P-51s that came off the production line at LAD and went straight to War. I recently found that magazine and decided to contact the English author for permission to use the article. Looking on the Internet, I found that he was affiliated with the Rathbone Museum of WWII Aviators. A quick note to the museum resulted in a splendid response suggesting that I contact his publisher in the UK, Osprey Publishing. A follow-up on the suggestion resulted in a charming response from Osprey that my request had been graciously passed on to the author. The following day, I received a message from the author himself, Christopher Shores, that he would be delighted in helping us, even with an update of the article and to provide us with accompanying photographs. Hence, the article "The Allison-Engined Mustang". Flying close to the deck, the airplane proved superior to anything flying! However, since most aerial combat at the time took place above 15,000 feet, there was no choice but to use it as a ground attack fighter-bomber called the A-36 Invader. As a fighter it became the RAF Mustang I.

Those of us that grew up reading the historical accounts about airplanes, written by English aviation historians and published in *Flight Magazine*, relish the extreme details assembled by the authors and written in what appears almost a state of frantic urgency. Such is the case with Mr. Shores and some of our readers may find this overwhelming. However, if you read the article a second time, you will find the author has included many nuances which define the intensity and the desperation with which England had to face the overwhelming Luftwaffe. Whatever men and planes that were available were sent into battle to try to stem the tide until better trained men and superior aircraft could be readied to take on the foe. This is their story and a worthy lesson for today!

Once again, it is time for the Bald Eagles Reunion to be held at the Proud Bird Restaurant on Saturday, April 18th. Every year as we gather, there are fewer of us and those that come show increasing signs that the years have taken their toll. Be that as it may, we are the best that this country had in times of great crises. With our creative minds, our ingenuity in design, our dedication in manufacturing the very best and our service in the field we delivered the best trainers in the T-6, the best medium bombers in the B-25, the best fighters in the P-51, the best jets in the F-86, the best jet bombers in the B-1, the best lunar spacecrafts in the Apollo-Saturn, the best space transporters in the Space Shuttle, the best Guidance Systems for space vehicles and nuclear submarines, the best Rocket Engines for a multitude of U.S. rocket ships, the first GPS and the first Integrated Engineering Program just to name a few. Our company no longer exists but we remain North American Aviation, Inc., the best that was and the best that is! So, let's make an effort to gather at least one more time. Our speaker is the renown Dr. Robert van der Linden, the Chairman of the Aeronautic Division of the Smithsonian Institution and his subject will be the "History of North American Aviation". Join us and let's share in the breaking of bread together one more time! If you feel the drive is too much, carpool or bring a relative or a friend to drive but do come! Spouses are most welcome!

Many of you have renewed your subscription early and we thank you for this courtesy. We even came out with the Winter Issue a week earlier to spread the renewal process over more days. However, when you think that you are ahead, the "gremlins" step in and cause more frustration. We sent our disc to the Addressing Company to print the names and addresses with the latest information. Somehow, the gremlins stepped into the process and reduced our "Subscription Due Date" above the names to a smudge. This caused much consternation among you, our readers, and our phone line was jammed with calls from you regarding the status of your subscriptions. We have called most of you back to reassure you that our records are in good shape and the Addressing Company is taking precautions to see that this does not happen again! We apologize for the errors and we ask for your patience.

The Allison-Engined Mustang

by Christopher Shores

Editor's Note: We are extremely grateful to the author for his gracious assistance in allowing us to publish this article and then providing the rarely seen photographs of the Allison powered Mustangs in battle action. All photographs are part of the Christopher Shores-Christopher Thomas-Steve Brooking Collection.

The first prototype, the NA-73X, first flew on 26 October 1940, by which time the British Purchasing Commission had already placed an order for 320 aircraft, to be serialled AG345 through AG664 and, eventually, to be named Mustang I after some consideration had been given to the name Apache.

The first Contract NA-73 Mustang I, A/C No. AG345, was rapidly followed by the second prototype, which featured the full armament. This was quite heavy, comprising a pair of .50 caliber Browning machine guns in the nose beneath the engine, synchronised to fire forward through the airscrew disc, a further gun of the same caliber being situated in each wing to fire outside the airscrew. Outboard of each of these were two .30 caliber Browning machine guns, making a total of eight guns. This second aircraft, A/C Number AG346, was shipped to England for tests, which quickly revealed that the NA-73 was far and away the best fighter so far purchased from the United States. Indeed, with its maximum speed of 382 mph, it proved both in speed and manoeuvrability to be one of the best fighters at low and medium altitudes then available to the RAF. Unfortunately, most fighter activity in Western Europe at this time was taking place at over 15,000 feet and the unsupercharged Allison engine simply did not offer the performance at higher altitudes to make the aircraft a viable proposition for issue to the day fighter squadrons. Its excellent low-level performance and heavy armament indicated its suitability for ground support, tactical reconnaissance and other duties of this nature, however, and it was decided that the Mustang provided the ideal replacement for the Westland Lysanders and Curtiss Tomahawks then equipping the squadrons of the Army Cooperation Command.

Consequently, an order for a further 300 aircraft was placed, A/C Numbers AL958 – AM257 and AP164 – AP263, these featuring minor changes which earned them a new manufacturer's designation, NA-83, although they were still Mustang Is to the RAF. In any event, only 527 of the 620 Mustang Is on order were to be delivered, the final 93 being replaced by similar Mk IAs financed through Lend-Lease. Delivery of the Mustang Is to the RAF began in August 1941, but not all the aircraft were to be issued to squadrons: four, AL963, AL975, AM203 and AM208, were used by Rolls-Royce for trial installations of the Merlin engine, being redesignated as Mustang Xs. Three more, AG357, AM106 and AM130, were used for tests of various rocket projectile installations by the Aircraft and Armament Experimental Establishment (AAEE). AM106 also carried a pair of 40mm Vickers 'S' guns beneath the wings in fairings similar to those employed on the Hurricane IID for a period, AM190 also went to the AAEE for a test installation of a 20mm Hispano cannon in each wing, and AG393 went to the RAE (Royal Aircraft Establishment) for drag tests associated with the application of camouflage paints.

By September 1940, with additional Lend-Lease funds becoming available, the USAAC ordered on behalf of Britain



Mustang I, A/C No. AM106, served at the Aircraft and Armament Experimental Establishment (AAEE) undertaking armament trials. This aircraft was fitted to carry underwing 60-lb rocket projectiles and a pair of 40mm Vickers 'S' anti-tank guns. It served with the research unit until it was surplussed on 7 November 1944.

150 P-51s, NA-91s serialled FD418 – FD567; these were similar to the XP-51s and Mustang Is, but the entire machine gun armament was replaced by four wing-mounted 20mm cannons. The first example of this new version appeared in July 1942; 93 were sent to Britain as Mustang IAs but 55 were retained by the USAAF (as it had now become) for conversion into F-6A tactical reconnaissance fighters. To accomplish this change, two F-24 cameras were fitted in the rear fuselage of each aircraft; U.S. serials in the 41-37000 were allocated. Two other airframes in the NA-91 contract were retained for use in the XP-78 project-the fitting of license-built Packard Merlin engines in the Mustang airframe. This proposal followed information from Britain about the successful tests with the Mustang Xs, and was to lead to the classic Merlin-engined P-51B. Meanwhile, the USAAF had become much more interested in the North American fighter, and ordered 500 Allison-engined versions for its own use, this order being modified in August 1942 to provide for these to be completed as A-36A attack bombers (Contract NA-97).

The A-36A version, Serial Nos. 42-83663 – 42-84162, again featured a revised armament: the .50 caliber nose and wing guns of the initial version were retained, but the outer wing weapons were replaced with the same caliber in each wing to make a total of six 'fifties'. Wing shackles were fitted for the carriage of a pair of 500-lb bombs and dive brakes were incorporated in the



Mustang I, A/C No. AM190, was delivered as a Mark I but was fitted with four 20mm Hispano cannons at the AAEE, serving then as a prototype for the Mark IA. It served with a non-operational unit until it was surplussed on 31 October 1945.

undersurfaces of the wing trailing edges. Deliveries commenced in September 1942, being completed the following March, when a single example, 42-83685, was delivered to the RAF in the United Kingdom for evaluation. Given the serial EW998, it was known to the RAF as the Mustang I (Dive Bomber).

To carry its heavy armament, the A-36A was powered by a 1,325 hp Allison V-1710-10, and tests in April 1943 at the USAAC proving grounds showed it to have a top speed in clean condition of 356 mph at 5,000 feet, 310 mph being reached at this altitude when bombs were carried. Three aircraft were used on these tests, one being lost when its wings failed during a vertical dive. The best form of attack for the aircraft proved to be a dive at a 70° angle at 450 mph, bombs being released at 4,000 feet. As a fighter-bomber and ground attack aircraft, the A-36A appeared to be excellent. However, as a vertical dive-bomber it left much to be desired because its clean configuration allowed speed to build up too rapidly. The aircraft also proved to be a fairly handy low altitude fighter. Among the recommendations at the end of these tests were that the dive brakes be eliminated and that flame dampers be installed on the exhaust stubs to allow night operations to be undertaken. It was also recommended that the aircraft be fitted with a fighter-type A-1 variable reflector gun sight.

Meanwhile, following completion of the A-36A order, North American began delivery in March 1943 of 310 P-51As (NA-99) powered by V-1710-81 engines offering 1,470 hp and carrying a reduced armament of four wing mounted .50 caliber machine guns. These were the fastest Mustangs yet to appear, having a top speed of 390 mph. They were also fitted with underwing shackles for bombs or long-range fuel tanks. Fifty of these aircraft were delivered to the RAF as Mark IIs, FR890 – FR939, as replacements for the 55 P-51s retained by the USAAF as F-6As. A further 35 were converted, by the installation of two F-24 cameras, into F-6Bs. The P-51A was the last variant of the Mustang design to be built before production switched to the much improved Merlin-engined versions which will not be covered here.

In British Service

Tests carried out in the UK between a Mustang I, a Spitfire V and a Typhoon, showed the Mustang to have many advantages over the Spitfire at low level, but to be generally inferior to the Typhoon except in manoeuvrability. When a Mustang IA was later tested against a captured Focke-Wulf Fw 190A, there proved to be little to choose between the two aircraft up to 23,000 feet. Each aircraft enjoyed certain advantages over the other, and each suffered certain disadvantages. In all tests, however, the lack of automatic boost on the Allison engine proved a disadvantage in combats below 15,000 feet, since the pilot had to continually check his boost gauge, as limitations could easily be exceeded in the heat of battle.

First RAF squadron to be re-equipped with the Mustang I was No. 26, which at first augmented, and then replaced, its Tomahawks with Mustangs, beginning in February 1942. Based at Gatwick, the unit was not to become fully operational until July by which time several other units were in the process of converting: in April, Mustangs began to replace Lysanders in No. 16 Squadron and Tomahawks in No. 613 Squadron, and the following month No. 239 Squadron also converted from Tomahawks, while No. 4 added a few Mustangs to a mixed bag of Tomahawks, Lysanders, Proctors and Battles. By late summer the following units had Mustangs, though not all had yet become operational: Nos. 2, 4, 16, 26, 63, 169, 239, 241, 268, 400 (RCAF), 414 (RCAF) and 613 Squadrons. To allow the aircraft augment tactical reconnaissance sorties with photographic evidence, provision was made for a single F-24 camera to be mounted at an oblique angle in the rear of the cockpit, behind the pilot.

Although the first Mustang sortie was flown by No. 26 Squadron over the French coast on 5 May 1942, and limited operations followed during July, the aircraft's real baptism of fire occurred during the combined operations landings in France at the port of Dieppe, on 19 August. No Mustang squadrons were at this time operational at full strength on the type, but several sent such aircraft as were available to operate



Taken just at the time when squadron codes were being dispensed with, the photo shows two aircraft of No. 26 Squadron which received Mustang Is at the start of 1942. The nearest aircraft carries the full marking, RM-B while the other only the aircraft letter D.



Assigned to No. 26 Squadron, the first RAF squadron to be re-equipped with the Mustang I in February 1942, the first sorties flown over the French coast took place in May 1942 and the first baptism of fire occurred on 19 August 1942 during the combined operations landings in France at the port of Dieppe. Aircraft RM-G, AM148, served with No. 26 Squadron until it was surplussed on 2 October 1944.



Tactical reconnaissance squadrons of the RCAF started receiving Mustang Is in June 1942. One of the first two to be so re-equipped was No. 400 Squadron. A/C No. AL971, with the unusual code SP-S and the name "Snard II" served with the squadron until it was converted to a PR role at the end of 1943.

in a composite wing. Flying in support of the ground forces by searching for German reinforcements, strafing ground forces etc., the Mustangs were over the area much of the day. Aircraft from the RCAF contingent operating with the wing became involved in the Mustang's first air combats of the war, when a flight of No. 414 Squadron was set upon by a number of Fw 190s. One Mustang was shot down and a second, flown by Plt Off Storer, collided with an obstruction while taking violent evasive action at very low level. This tore off a section of the starboard wingtip some 3 feet in length, including half of the aileron but the pilot succeeded in nursing his damaged aircraft back to England, where he crash-landed at his base. Flg Off Hills shot down one of the attacking Fw 190s during the fight—the first of many victories to be claimed by Mustang pilots during the next three years.

Following the Dieppe operations, Mustangs began to fly regular reconnaissance and general strafing missions ('Rangers' and 'Rhubarbs') respectively over Occupied Europe. Locomotives were a particularly favoured target, pilots of No. 400 Squadron claiming more than 100 destroyed or damaged during their first six months of operation. In October, one reconnaissance mission was flown over the Dortmund-Ems Canal, this being the first occasion on which RAF single-engined aircraft had flown over Germany during World War II and giving an early indication of the Mustang's excellent range, which was later to be greatly extended.

Although Mustangs were frequently over Axis territory, the low altitude at which they operated and the small formations in which they generally flew meant that they were not often intercepted by *Luftwaffe* aircraft, and such combats as did take place were usually the result of chance encounters. One such occasion occurred on 26 November 1942, when four Mustangs of No. 268 Squadron left Snailwell to make an offensive patrol over Holland during the early afternoon. When near Elberg and flying very close to the ground, Plt Off R. P. Bethell saw a Bf 109F flying alone at 1,500 feet climbing, he attacked at 250 yards and closed on the Messerschmitt, firing two burst until he was only 15 yards from his target, which burst into flames and crashed. Turning to continue his patrol, Bethell then saw a Ju 52/3m crossing the coast at 500 feet, and this he also attacked closing from 300 to 30 yards, firing one long burst. The transport poured heavy smoke and crashed, exploding on impact; one parachute was seen. The defences were now well alerted and, as the flight reformed, a hail of light flak caught Flt Lt W. M. R. Griffin's Mustang which was shot down. During the same day, other Mustangs from No. 613 Squadron engaged a Fw 190, which was shot down by Flg Off Grant.

During October, No. 241 Squadron had been chosen as one of the units to accompany the forces embarking for the Allied landings in French North Africa the following month, but it was decided that the Mustangs should not go to this new theater, and they were replaced by Hurricane IICs, being handed instead to No. 168 Squadron to replace that unit's Tomahawks.

Late in 1942, No. 309 (Polish) Squadron received some Mustangs to operate alongside its Tomahawks, beginning operations from Peterhead in Scotland in December on anti-shipping sweeps across the North Sea. Early in 1943, a third Canadian unit, No. 430 Squadron, also replaced its Tomahawks with Mustangs, entering operations in May, while in April No. 516 Squadron was formed in Scotland with Mustangs, Blenheims, Ansons, Lysanders and Proctors. This unit, however, was never to see operational flying, and within a year had relinquished all its Mustangs.

Thus, by the Spring of 1943, no fewer than 14 squadrons of the Army Cooperation Command were flying Mustangs, some on operations over the Continent, others taking part in large scale operations exercises with the Army. Another squadron, No. 116, also used a few Mustangs for radar calibration work.

Occasional combats still occurred: Nos. 268, 400, 414 and 613 Squadrons made a number of claims during the year, the most successful in this field being the Canadians of No. 400, who had claimed ten confirmed victories by mid-November. Two of these were gained in unusual circumstances: during the night of 14-15 August, Flg Off Hanton flew a night intruder sortie, intercepting and shooting down a Bf 110 night fighter. Next night, Flg Off Morton repeated the sortie with similar results. In this same period, Nos. 268, 414 and 613 Squadrons claimed two victories each and No. 2 Squadron claimed a Bf 109.

Earlier, on 11 May 1943, a formation of Fw 190 "hit-and-run" fighter-bombers were intercepted off the south coast of England by four Mustang Is of No. 613 Squadron. A Fw 190 belonging to 5./SKG 10 was shot down, apparently by Flg Off J. Townsend in AP248—he was credited with one confirmed destroyed with the other pilots claiming three more damaged.

In early summer 1943, Army Cooperation Command was disbanded, the squadrons being taken over by Fighter Command as part of the nucleus of a new tactical air force to support the planned Allied landing in Western France. On 13 November, 2nd Tactical Air Force came into being and all Mustang squadrons became part of this organisation. By this time the cannon-armed Mustang IAs had begun to appear, replacing No. 268 Squadron's Mark Is in August and No. 63's in November. However, the number of units flying the Allison-engined Mustangs was already dwindling fast; first to go was No. 16 Squadron, which converted to Spitfire IXs during September. Nos. 4 and 26 also changed to Spitfires before the end of the year, while Nos. 169 and 239 Squadrons became Mosquito night-fighter units, and No. 613 a Mosquito intruder unit. Early in 1944, the Poles of No. 309 Squadron exchanged their Mustangs for Hurricane IVs and by early spring No. 63 had gone over to Spitfires.

Upon the formation of 2nd TAF, squadrons were allocated to two Groups, 83 and 84, though operations continued under the direction of the old Fighter Command Groups in whose area they were situated. When the Invasion took place, 83 Group would support the British 2nd Army, while 84 Group supported the Canadian 1st Army. The three Canadian squadrons now came under 83 Group, forming 39 (Recce) Wing, while Nos. 2, 4, 168 and 268 Squadrons formed 35 (Recce) Wing in 84 Group. In November 1943, the squadrons were still flying basically fighter-type sorties—'Rhubarbs' and 'Rangers'—in pairs and fours over enemy territory, looking for targets of opportunity. On 2 November, on one such operation, Flg Offs R. O. Brown and G. Wonnacut of No. 414 Squadron strafed four trains and a barge, and shot down two Fw 190s, all in the Cambrai area. Nine days later, two aircraft from No. 400 Squadron caught three Me 210s near Arras. Flt Lt K. L. Marham and Flg Off J. M. Robb each claiming one shot down and Robb also probably destroying the third.

During December 1943, all Mustang units with 2nd TAF began flying a series of photo-reconnaissance sorties along the Channel coast, to provide a full coverage of all coastal defences and fortifications, and also of the airfields and lines of communication for some way inland. At this time, No. 4 Squadron began converting to unarmed PR Mosquitos and Spitfires, as did No. 400 Squadron the following month. During these PR operations, *Luftwaffe* fighters were often seen and, although generally evaded, inflicted a number of losses. On 22 December, two aircraft from No. 268 Squadron were chased by Fw 190s south of Hesdin but escaped, one of their pursuers apparently crashing while trying to follow them at zero feet. Next day, however, two more Mustangs, this time from No. 2 Squadron, failed to return. Despite the concentration on photographic work, the odd offensive mission was fitted in, generally in conjunction with a reconnaissance, and on 28 January 1944, four of No. 414 Squadron's Mustangs flew a morning 'Ranger', first to photograph a bridge at Rugles, and then to patrol over the Chartres areas. Shortly after midday, they spotted two unidentified single-engined aircraft at low level, these proving to be Arado advanced trainers. Both were shot down, one by Flg Off R. O. Brown and one by Flt Lts Wonnacott and Burroughs. After reforming, the Mustangs encountered two Bf 109s, Wonnacott and Burroughs each shooting down one, though Flg Off Brown failed to return.

Throughout early 1944, all Mustang squadrons were sent to Armament Practice Camps for refresher courses in air-to-ground firing, and during February, No. 168 Squadron exchanged its Mk IAs for No 2 Squadron's Mk Is and moved to Odiham to join 39 Wing. Nos. 2, 268 and 414 Squadron pilots were also sent to a special course in the art of spotting for Naval bombardment. During April, Nos. 414 and 430 Squadrons frequently dispatched aircraft to accompany formations of Spitfire and Typhoon fighter-bombers to take pictures of the destruction wrought by these aircraft on the Atlantic Wall and other targets, immediately following their attacks. The eve of D-Day thus found 35 Wing with two Mustang units, Nos. 2 and 268, both flying Mk IAs, and 39 Wing with three, Nos. 168, 414 and 430, all with Mk Is. On 6 June, the day of the initial landings in Normandy, Nos. 2, 268 and 414 Squadrons all spotted for the guns of the Fleet, while Nos. 168 and 430 Squadrons flew many tactical reconnaissance (Tac R) missions around the beachhead area. The latter unit was unfortunate in meeting some of the few *Luftwaffe* fighters to appear, and one Mustang was lost. Next day, all five squadrons concentrated on Tac R sorties, during one of which Flt Lt Burroughs and Flg Off Bromley of No. 414 Squadron shot down a Ju 52/3m behind the lines.

All the Mustang squadrons were extremely busy during the first three months of the Invasion, before the breakout from the beachhead, and during this period losses to both flak and fighters were far from light. Early in June, No. 2 Squadron began receiving the faster Mustang IIs to replace the Mk IAs, being the first unit of the RAF to receive these aircraft. No. 83



An aircraft from the No. 39 Reconnaissance Wing of the 2nd Tactical Air Force's No. 83 Group based at Odiham displaying the full set of black and white Invasion stripes applied for the Normandy landings.

Group units were the first to move to France, Nos. 168 and 430 Squadrons flying to Landing Ground B.8 on 28 June, followed by No. 414 Squadron two days later. In 35 Wing, No. 268 Squadron now received a number of Typhoon IBs to supplement its Mustangs IAs, and one flight was soon to be re-equipped with these.

Despite the losses and the need to concentrate on the reconnaissance work, the Mustang could still fight back most effectively, as 39 Wing showed on 4 July when twelve Fw 190s and Bf 109s attacked two aircraft of No. 414 Squadron. A third Mustang was flying top cover, and its pilot, Flg Off Younge, quickly shot down one Fw 190, allowing his companions to make good their escape. Younge was again involved in a sortie on 23 July when he and Flg Off Russell noted five staff cars between Evreux and Dreux, and strafed all of them to destruction. Three days later, however, two of the squadron's aircraft were intercepted by sixteen Fw 190s over the front and one was lost. Other successes against German fighters were achieved during the summer. Flg Off Mossing of No. 414 Squadron sharing in the destruction of an Fw 190 with another unit on 7 June, Flt Lt Tuele of No. 268 Squadron shooting down another on 10 June and Flg Off Lowndes of No. 430 Squadron claiming a third on 26 August.

Late in July, 35 Wing also moved to France, operating initially from the B.10 landing ground. Some changes took place in 39 Wing at about this time, with No. 414 Squadron re-equipping on Spitfire IXs in August, and following the rapid advance across France and into Belgium and Holland during September, No. 168 Squadron's role was changed to that of a fighter-bomber unit and it left the Wing, exchanging its Mustangs for Typhoons. By October, 39 Wing was at Eindhoven in Holland and 35 Wing at Antwerp in Belgium, where they were to stay for some time as the line now stabilised with the onset of a bad autumn. It was here that the Mustangs began a new duty, 'Arty R', spotting for army artillery batteries and correcting their fire—a somewhat hazardous operation as it involved a prolonged presence over the territory under fire, this usually precipitating a furious reception from the enemy below.

Further changes gradually took place, one squadron from each Wing being selected in November to begin re-equipping with the latest Spitfire FR Mk XIVs; these arrived slowly, and both units involved, Nos. 2 and 430 Squadrons, continued to operate their Mustangs, although in diminishing numbers, throughout the rest of the year. This left only No. 268 Squadron in 2nd TAF equipped with Mustangs, but No. 2 Squadron passed its Mk IIs to this unit in which they were used to replace the flight of Typhoons, the squadron thus becoming fully Mustang-equipped again with one flight on Mk IAs and the other on Mk IIs. In December, 35 Wing also into Holland, settling at Gilze-Rijen, where it was based on 1 January 1945 when the *Luftwaffe* made its famous *Bodenplatte* New Year's Day attack on Allied airfields. One aircraft of No. 268 Squadron was taxying for take-off when the attack began and was damaged, but none of the unit's other Mustangs were touched. However, during the day, two of the squadron's aircraft caught and shot down a Ju 188, the last recorded victory of the war for the Allison-Mustangs: Flt Lts Mercer and Lyle were the successful pilots. At Eindhoven, several of No. 430 Squadron's remaining Mk Is were damaged and within a week none were left on strength there. No. 268 Squadron soldiered on, moving nearer to the front in March 1945 for the Rhine crossings. From its new base, it joined in a special 35 Wing assault on craft on this river, a large number of barges, tugs and other vessels being strafed. Despite occasional losses to the increasingly dense and deadly light flak, the squadron remained on operations until the fighting ended early in May.

Meanwhile, in England, two ex-Mustang squadrons had once again received these aircraft; in October 1944 Polish Squadron 309 exchanged its Hurricane IVs for the familiar Mustang Is, but it turned out this was only to refamiliarise the pilots with the North American aircraft before the arrival of the Merlin-powered Mk IIIs. During the same month, No. 26 Squadron also reconverted and this unit retained its aircraft to fly PR sorties from bases in England over the launching sites of V-2 rockets in North-West Europe, pinpointing these for attack by Spitfire dive bombers. In April 1945, the squadron moved to France, not to join 2nd TAF, but to spot for naval guns firing on besieged German garrisons in strongholds along the Atlantic Wall in the Bordeaux area. It remained on these duties during the closing weeks of the war. Immediately following the cessation of hostilities, all Allison-powered versions of the Mustang very rapidly disappeared from RAF service.

The Mediterranean Area

In North Africa late in April 1943, as the Tunisian campaign was drawing to a close, No. 225 Squadron at Souk el Khemis took on strength a pair of F-6As borrowed from the USAAF's XII Air Support Command. These aircraft, 41-37361 and 41-37366, were to be used to augment the unit's Spitfire Vs on longer-ranged tactical and photographic reconnaissance missions. The first sorties were undertaken on 21 April, these and subsequent missions proving relatively uneventful until 5 May. On this latter date, both Mustangs were on a photographic mission over Tunis and Bizerta at 7-8,000 ft, escorted by a dozen Spitfire IXs of No. 72 Squadron, when they were intercepted by two Fw 190s. The Mustangs immediately gave combat, attacking the German fighters and reporting strikes on one; the Focke-Wulf pilots thereupon broke off and departed.

The fighting in Africa ended on 13 May, but by this time No. 225 Squadron had received two more Mustangs, 41-37424 and 41-37428, and at the same time four more aircraft, 41-37364, 41-37368, 41-37370 and 41-37414 were issued to No. 14 Squadron. This latter unit was based on the North African coast at Blida, operating Martin Marauder I bombers on shipping reconnaissance sorties over the Western and Central Mediterranean. Many formations of enemy transport aircraft and their escorts, as well as reconnaissance aircraft, were being seen daily by the Marauder crews, and the formation of a Mustang Flight within the squadron allowed some effective action to be taken against them. The Flight began operations on 29 May, and next day Flg Off Crawford in 41-37364 with Flt Sgt Campbell in 41-37414, shot down a Ju 52/3m transport, the first victory to be gained by Mustangs in the Mediterranean theater. The following day, 31 May, Flt Lt D. Blair and Plt Off J. K. K. Gildner claimed an Italian Fiat RS.14 floatplane off the east coast of Sardinia.

On 2 June, the squadron moved to Protville, and from there on the 7th of the month, Blair and Gildner in 41-37370 and 41-37368, while on reconnaissance of the Gulf of Oristana, shot down another Fiat RS.14. Operations thereafter tailed off, and

no more were undertaken after mid-June. No. 225 Squadron, meanwhile, was undertaking few missions, though maintaining two or three Mustangs serviceable during this period. Each Mustang had been painted with an individual letter, but late in July all four aircraft were handed to the USAAF's 111th Observation Squadron, to which No. 14 Squadron's Mustangs had already been transferred. This was, however, not to be the end of the Allison-engined aircraft's service with the RAF in the area. No. 1437 Strategic Reconnaissance Flight, based in Tunisia, had at this time handed in the Martin Baltimores with which it had previously operated and was awaiting re-equipment with faster aircraft. Early in July, six A-36A Invaders were borrowed from the Americans, these being 42-83829, 42-83898, 42-83906, 42-84018, 42-84019 and 42-84117. RAF roundels were painted on and the fuselage-mounted pair of .50 caliber machine guns were removed, leaving an armament of four 'fifties' in the wings; cameras were then fitted. On 11 July, the Flight moved to Malta with five aircraft and at once began reconnaissance missions at low level over Sicily, also undertaking a fair amount of strafing. On the last day of the month, two of the aircraft were hit by flak when on a mission near Agusta, and one of these went into the sea in flames.

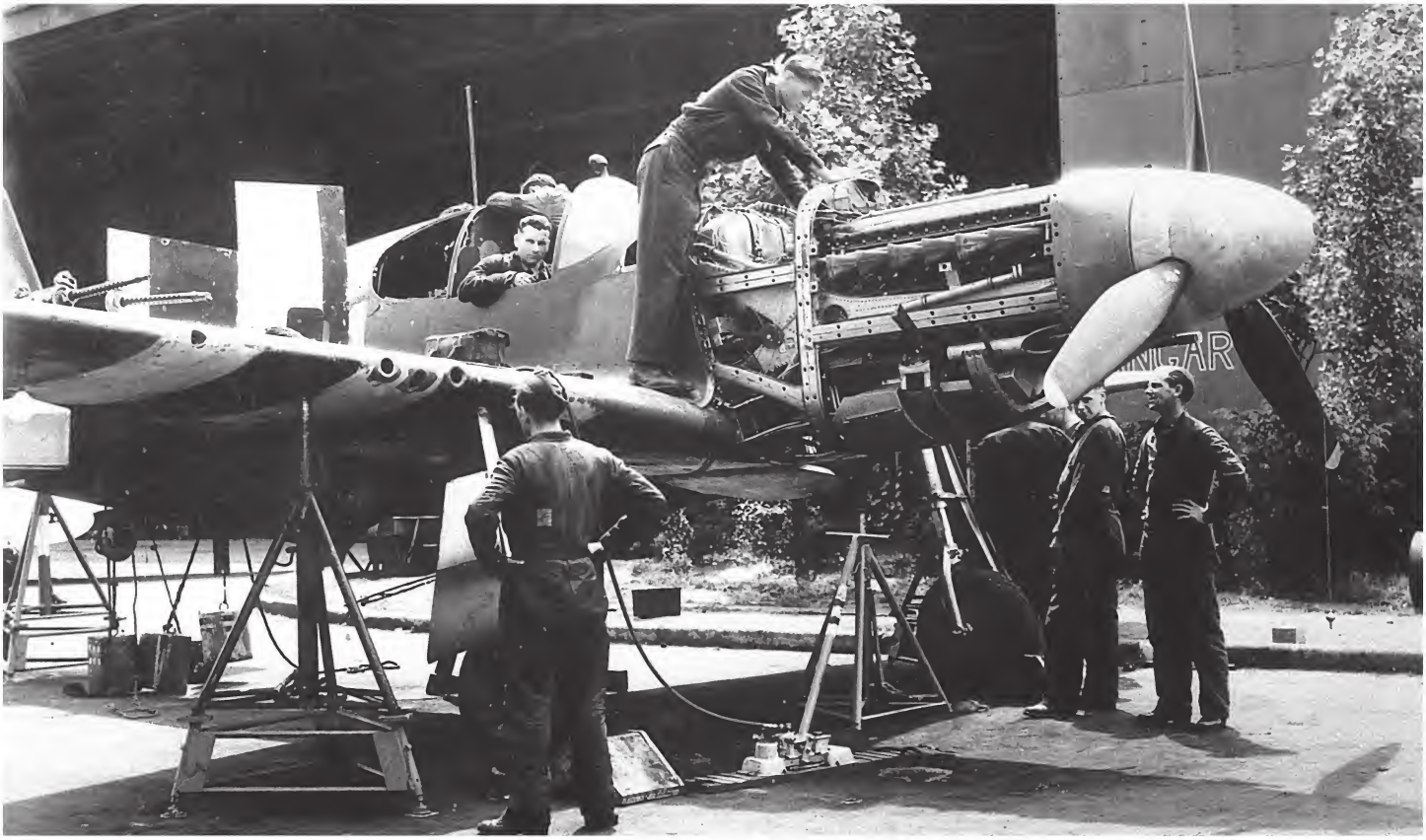
In August, the Flight moved its four remaining serviceable aircraft to Francesco in Sicily, and the aircraft now received the British serials HK946, HK947, HK955, and HK956, also being marked with individual letters A, B, C, and D. On 16 August, a pair of Spitfire VBs were received, but comparative trials showed the performance of these to be inferior to that of the A-36 at low level. Next day, however, HK947 'A' unfortunately shot down a Spitfire V of No. 43 Squadron by mistake into the Straits of Messina; the Invader was then itself hit by



One of a small batch of A-36As loaned by the U.S. 12th Air Force to the RAF in North Africa in 1943. It was flown by No. 1437 Strategic Reconnaissance Flight conducting long-range low-level recce flights.

Axis 20mm flak, and the pilot was forced to bail out. Both he and the unfortunate Spitfire pilot were picked up by the same Walrus air-sea rescue amphibian, in which the conversation is best left to the imagination! Immediately following the final collapse in Sicily, operations continued over the 'toe' of Italy, but by September these were becoming restricted due to the shortage of aircraft. In October, the Flight moved to Palazzo on the mainland, and then to Foggia, but on 13 October it was disbanded as no new aircraft were forthcoming.

The final appearance of RAF Allison-Mustangs in the area occurred in March 1944 when a few Mk Is were sent out from England to No. 269 Squadron in Italy, but these were not for operations, being provided only for the pilots to familiarise themselves with the general handling characteristics of the aircraft before Merlin-powered Mk IIIs arrived later in the month to replace the unit's Kittyhawks.



A Mustang I on tressles undergoing a complete overhaul at an RAF hangar with the .50-caliber machine guns removed and placed on top of the starboard wing.

In American Service

Late in 1942, elements of the USAAF 12th Air Force went into action in French North Africa, first supporting the Allied landings there, and then taking part in the hard battle to drive the Axis out of the African continent. One of the early units to arrive direct from the United States was the 68th Observation Group, which included three squadrons with a variety of equipment including the Bell P-39 Airacobras and Douglas A-20 Havocs. In the event, the P-39s were concentrated into the 154th Observation Squadron, and this was the only part of the Group to see action over Tunisia, the other two squadrons remaining in Morocco. Flying tactical reconnaissance and strafing missions, it soon became apparent that while the P-39 was a competent ground attack aircraft, it lacked the performance necessary to survive if intercepted by enemy fighters when on reconnaissance sorties. Consequently, the USAAF's first service version of the Mustang, the F-6A (P-51) was shipped over to Morocco and was issued to the 154th during April 1943, going into service during the final phase of the Allied attack on Tunis. The unit suffered its first loss on 23 April when four Mustangs carrying out a strafing attack along the Pont du Fahs to Medjez road, were fired on by American anti-aircraft batteries and one was shot down.

In December 1942, the 27th Bombardment Group under Lt. Col. John Stevenson, arrived at Mers el Kebir in Morocco, but it's A-20s were sent to reenforce the 47th Bombardment Group at the front in Algeria, the 27th then being re-equipped with A-36As, which arrived at Fez. Christened "Invader", the A-36A was just too late to see action over Africa, but on 6 June 1943 the Group's three squadrons, the 522nd, 523rd and 524th, entered action when 34 of its Invaders swept over Sicily. During the same month, attacks were also made on the islands of Pantelleria and Lampedusa. A second fighter-bomber group, the 86th consisting of the 525th, 526th and 527th, had received A-36As as its initial equipment at Key Field, Mississippi, late in 1942, and this unit was ready for action by March 1943, being shipped to North Africa from where it went into action over Sicily during July. Both groups then took part in supporting the landings on this island, operating over the Western and Central areas of the front. In the period 1-18 July 1943, 1,238 sorties were flown over Sicily, 25 Invaders being shot down by flak.

The first elements of the XII Air Support Command, 12th Air Force, moved to Sicily before the end of July, and these included the units of the 64th Fighter Wing. One of the Wing's squadrons was the 111th Observation Squadron, which like the 154th Squadron in Tunisia, also formed part of the 68th Observation Group and was also now equipped with F-6As, including those recently repossessed from the RAF's Nos. 14 and 225 Squadrons. This unit undertook 38 tactical reconnaissance sorties during the first two weeks of July, then moving to Malta and undertaking about two sorties per day for the rest of the month.

When the Axis forces began evacuating Sicily, the A-36As were to the fore, joining P-40s in bombing and strafing merchant vessels, barges, Siebel ferries and other craft attempting to cross the Straits of Messina. Prior to the invasion of the Italian mainland, A-36s attacked rail and road junctions and marshalling yards throughout Calabria and during one such mission, aircraft of the 27th Group's 522nd Squadron became embroiled in the Invader's first serious combat. Returning from an attack on railroad yards at Catanzaro on 19 August, one pilot whose aircraft had been hit by flak was forced to bail out into the sea. Two flights were circling over him when they were suddenly attacked from out of the sun by a dozen Bf 109s, five of the unwary Invaders being shot down. The survivors turned into their attackers, who seemed to be very inexperienced pilots, and shot five of them for no further loss.

The Allied landings at Salerno, on the west coast of Italy, began on 9 September, and A-36As joined P-38s, Spitfires and Royal Navy Seafires on patrols over the beachhead, taking advantage of their good range. Again, the 522nd Squadron became involved in combats, claiming four Fw 190 fighter-bombers for the loss of one aircraft on 13 September, and two more of these 'Jabos' next day. On one unfortunate occasion, one Invader pilot continually made such determined attacks on a flight of Seafires that they were forced to shoot him down—fortunately, without causing him serious injury! In the course of the severe ground battle to retain a foothold at Salerno, the 86th Group was responsible for preventing three *Panzer* formations reaching Salerno on 10 September as a result of its attacks. A pair of Invaders also sank a 50,000-ton Italian transport of the *'Conte Di Savoia'* class while it was riding at anchor at Baguara. Support was also given to the landings on the 'toe' and 'heel' of Italy by the 8th Army, Axis movements being hindered by an attack on the road junction at Catanzara, and on the road and rail complex at Cosenza. By 21 September, the whole of the 86th Fighter-Bomber Group had moved to the mainland, being based at Paestum, near Salerno.

The 111th Observation Squadron, by this time redesignated a Tactical Reconnaissance Squadron, also took an active part in the Salerno landings; it was assigned to fly reconnaissance missions for VI Corps, while No. 225 Squadron, RAF, flew similar missions with its Spitfires in support of X Corps, these duties commencing on D-Day + 3 (12 September). The 111th had

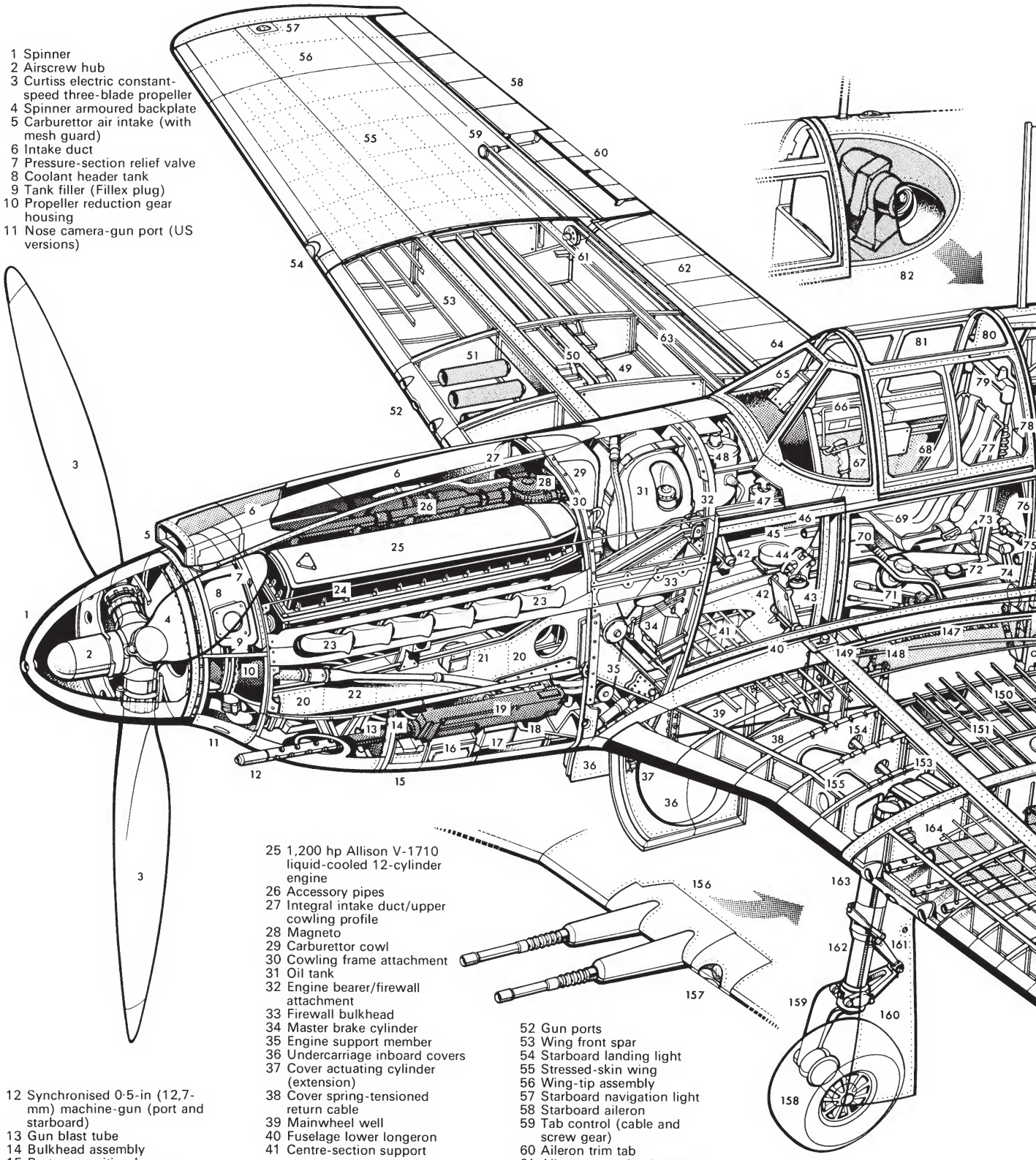
OUT OF AFRICA WITH BOB HOOVER

In 1943, Bob Hoover was sent to North Africa as a replacement pilot. Because of his experience as a pilot, the Army Air Forces deemed him more qualified to test new aircraft shipped in crates and assembled by GI mechanics rather than to fly in combat. Chafing with the wish to fly missions, Bob made the best of things and test flew the various A-36s, P-38s, P-39s, P-40s, P-51s, Spitfires, and Hurricanes. Although he was expected only to put some slow time on the machines, he would at times find ways to express his feelings as recorded by a fellow pilot, Bob Boyne:

"It's 1943 and my outfit...and the 438th Squadron have retreated back to Rabat, Morocco to regroup, etc. At this big base, P-51s are shipped in crates, bolted together, and guess who takes them up, Bob Hoover... My outfit is living in pup tents and they are lined up along a company road which dead-ended at our three hole latrine.

"One fine day, I am in the latrine facing down the company street when suddenly I see Hoover in a P-51 on the deck coming right at me. Me and that latrine almost went over from the wash. I think I was constipated for a week!"

North American P-51 Mustang Cutaway Drawing Key



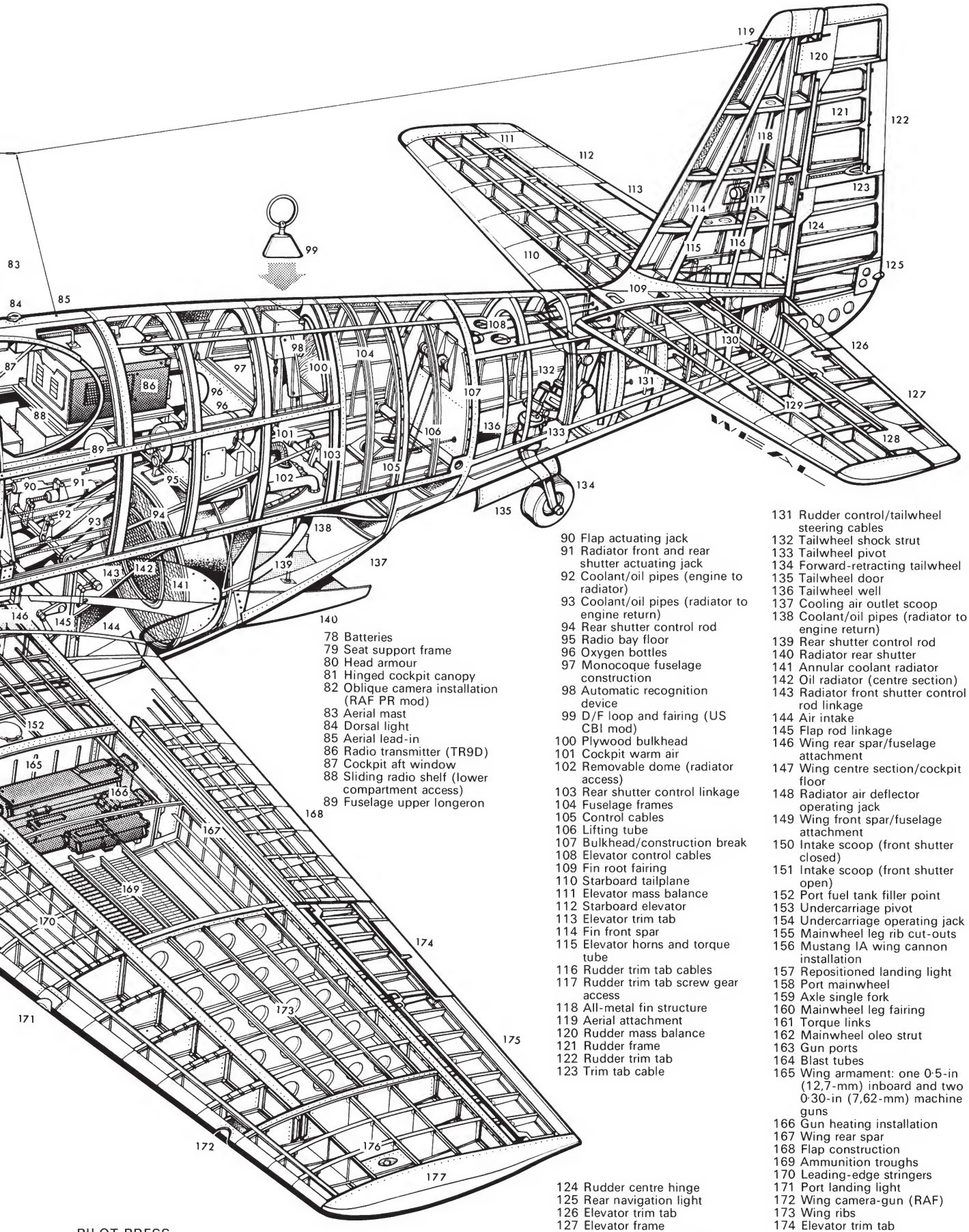
1 Spinner
2 Airscrew hub
3 Curtiss electric constant-speed three-blade propeller
4 Spinner armoured backplate
5 Carburettor air intake (with mesh guard)
6 Intake duct
7 Pressure-section relief valve
8 Coolant header tank
9 Tank filler (Fillex plug)
10 Propeller reduction gear housing
11 Nose camera-gun port (US versions)

12 Synchronised 0·5-in (12,7-mm) machine-gun (port and starboard)
13 Gun blast tube
14 Bulkhead assembly
15 Port ammunition box
16 Starboard ammunition box
17 Case and link container
18 Drain box
19 Machine-gun breech (angled)
20 Engine bearer
21 Rubber-mounted support block (within bearer)
22 Coolant pipe
23 Exhaust stacks
24 Cowling frame

25 1,200 hp Allison V-1710 liquid-cooled 12-cylinder engine
26 Accessory pipes
27 Integral intake duct/upper cowling profile
28 Magneto
29 Carburettor cowl
30 Cowling frame attachment
31 Oil tank
32 Engine bearer/firewall attachment
33 Firewall bulkhead
34 Master brake cylinder
35 Engine support member
36 Undercarriage inboard covers
37 Cover actuating cylinder (extension)
38 Cover spring-tensioned return cable
39 Mainwheel well
40 Fuselage lower longeron
41 Centre-section support structure
42 Rudder pedals
43 Fuel cock (selector valve control)
44 Control column linkage
45 Aperiodic compass
46 Cockpit warm air
47 Hydraulic filter
48 Hydraulic tank
49 Starboard wing gun bay
50 Ammunition feed chutes
51 Blast tubes

52 Gun ports
53 Wing front spar
54 Starboard landing light
55 Stressed-skin wing
56 Wing-tip assembly
57 Starboard navigation light
58 Starboard aileron
59 Tab control (cable and screw gear)
60 Aileron trim tab
61 Aileron operating lever and cable
62 Starboard slotted flap
63 Wing rear spar
64 Bullet-proof windscreen
65 Reflector gunsight
66 Quarterlight clear-vision panel (US CBI mod)
67 Control column
68 Pilot's seat
69 Seat harness
70 Trim control wheels

71 Undercarriage selector and tailwheel lock levers
72 Cold air control
73 Aileron links
74 Cockpit cold air
75 Elevator linkage
76 Reinforced turnover crash pylon
77 Pilot's seat spring suspension



78 Batteries
79 Seat support frame
80 Head armour
81 Hinged cockpit canopy
82 Oblique camera installation (RAF PR mod)
83 Aerial mast
84 Dorsal light
85 Aerial lead-in
86 Radio transmitter (TR9D)
87 Cockpit aft window
88 Sliding radio shelf (lower compartment access)
89 Fuselage upper longeron
90 Flap actuating jack
91 Radiator front and rear shutter actuating jack
92 Coolant/oil pipes (engine to radiator)
93 Coolant/oil pipes (radiator to engine return)
94 Rear shutter control rod
95 Radio bay floor
96 Oxygen bottles
97 Monocoque fuselage construction
98 Automatic recognition device
99 D/F loop and fairing (US CBI mod)
100 Plywood bulkhead
101 Cockpit warm air
102 Removable dome (radiator access)
103 Rear shutter control linkage
104 Fuselage frames
105 Control cables
106 Lifting tube
107 Bulkhead/construction break
108 Elevator control cables
109 Fin root fairing
110 Starboard tailplane
111 Elevator mass balance
112 Starboard elevator
113 Elevator trim tab
114 Fin front spar
115 Elevator horns and torque tube
116 Rudder trim tab cables
117 Rudder trim tab screw gear access
118 All-metal fin structure
119 Aerial attachment
120 Rudder mass balance
121 Rudder frame
122 Rudder trim tab
123 Trim tab cable
124 Rudder centre hinge
125 Rear navigation light
126 Elevator trim tab
127 Elevator frame
128 Elevator mass balance
129 Tailplane structure
130 Rudder control linkage
131 Rudder control/tailwheel steering cables
132 Tailwheel shock strut
133 Tailwheel pivot
134 Forward-retracting tailwheel
135 Tailwheel door
136 Tailwheel well
137 Cooling air outlet scoop
138 Coolant/oil pipes (radiator to engine return)
139 Rear shutter control rod
140 Radiator rear shutter
141 Annular coolant radiator
142 Oil radiator (centre section)
143 Radiator front shutter control rod linkage
144 Air intake
145 Flap rod linkage
146 Wing rear spar/fuselage attachment
147 Wing centre section/cockpit floor
148 Radiator air deflector operating jack
149 Wing front spar/fuselage attachment
150 Intake scoop (front shutter closed)
151 Intake scoop (front shutter open)
152 Port fuel tank filler point
153 Undercarriage pivot
154 Undercarriage operating jack
155 Mainwheel leg rib cut-outs
156 Mustang IA wing cannon installation
157 Repositioned landing light
158 Port mainwheel
159 Axle single fork
160 Mainwheel leg fairing
161 Torque links
162 Mainwheel oleo strut
163 Gun ports
164 Blast tubes
165 Wing armament: one 0·5-in (12,7-mm) inboard and two 0·30-in (7,62-mm) machine guns
166 Gun heating installation
167 Wing rear spar
168 Flap construction
169 Ammunition troughs
170 Leading-edge stringers
171 Port landing light
172 Wing camera-gun (RAF)
173 Wing ribs
174 Elevator trim tab
175 Elevator frame
176 Port navigation light
177 Port wingtip

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DRAWING

also trained for naval gun spotting, a task in which it proved so successful that the commanding officer of the *USS Philadelphia* reported later that it was "by far, the most successful method" so far tried for directing ships' fire. On 18 September, F-6As directed artillery fire on enemy gun positions, the first time in the European war that fighter-type aircraft had done so; these were similar to the operations later to be practiced by 2nd TAF Mustangs as 'Arty Rs'. During this period, the squadron received a few A-36As to make good F-6A wastage.

Both A-36A groups and the Tac R squadron remained part of XII Air Support Command throughout the rest of 1943 and early 1944, the Invaders flying many close support sorties over the front. Opportunities continued to occur from time to time for the A-36A to show its teeth as a low level fighter. The successful 522nd Squadron claimed six Bf 109s shot down during two combats in the Rome area on 28 October and a He 111 shot down on 3 December. On 8 December, Lt. Michael T. Russo of this squadron shot down one of three Ju 52/3ms as it was taking off; this was the unit's 25th victory and his third; more were to follow. On 30 December, Lt. Russo shot down two bomb-carrying Bf 109s to raise his personal score to five, making him the only A-36A 'ace' of the war. During December, thirty six Invaders followed B-25s in an attack on Ciampino airfield, near Rome, and the following month 50 bombed the docks at Civitiaveccia—the nearest port to the capital—on two occasions. Early in the new year, pre-invasion strikes were flown in the Anzio area and, following the landings there, regular attacks were made on troops and vehicles involved in the German counterattacks. Generally, the A-36As hit the lines of communication in the immediate rear, while XII ASC P-40s struck at the battlefield targets. Between 22 January and 15 February 1944, 1,385 effective sorties were undertaken by the A-36As during which thirteen aircraft were lost to flak and two to Bf 109s.

In March 1944, A-36As provided the main support for the first attack on Cassino, flying 154 sorties in four days, and in April they bombed the Littoria marshalling yards. By now, however, half the total of the A-36As built had been lost to one cause or another, and in order to keep the units operating until more modern equipment was available, the 27th Group was partially re-equipped with P-40s taken over from the 33rd Fighter Group, which had left Italy for India during January 1944. Soon afterwards, the Group re-equipped fully with P-47D Thunderbolts, and in May, when the breakout from the Anzio beachhead took place, only 56 Invaders of the 86th Group at Pomigliano were available. These undertook their last missions during the first eight days of July, a German fighter being shot down on the 7th on the last-but-one mission by Lt. Col. D. B. Rathburn, who had earlier led the 27th Group's 522nd Squadron. Immediately, thereafter this Group also converted to P-47s prior to the invasion of Southern France, and during this same period the 111th Squadron began replacing its remaining F-6As and A-36As with later model Merlin-Mustangs.

USAAF in North-West Europe

Allison-engined Mustangs also saw service with the USAAF in England, for when the 9th Air Force was moved there and began operating late in 1943 preparatory to supporting the forthcoming invasion of North-Western France, one of the early units to arrive was the 107th Tactical Reconnaissance Squadron of the 67th Tactical Reconnaissance Group. This unit initially flew reverse lend-lease Spitfire Vs, but in October about two dozen F-6Bs were received, these converted P-51As flying missions similar to those undertaken by 2nd TAF Mustangs from December 1943 until June 1944. Most were then replaced by the later models with Merlin engines. Five F-6Bs were lost in action, but a few of the survivors remained with the unit until the final months of the year. Some F-6Bs, as well as some F-6Bs in Italy, were fitted during their service with bulged Malcolm hoods (canopies) over their cockpits, similar to those used on P-51Bs, P-51Cs and RAF Mustang IIIs.

In the Far East

It was only in the neglected China-Burma-India theater that Allison-Engined Mustangs were to see service in the Far East. The first arrived in Assam, north of the Indian-Burmese frontier, in the late summer of 1943 to join the US 10th Air Force. These were aircraft of the 311th Fighter-Bomber Group consisting of the 528th, 529th and 530th Squadrons, which arrived from the United States via Australia. The Group was equipped with about forty A-36As, strength being made up with a batch of first production P-51As. Initial duty for this group was to cover and support the Chinese and American ground forces in the area, particularly those moving down the route of the new Ledo Road. Immediately on arrival, one squadron was inactivated to release personnel for the P-38 equipped 459th Fighter Squadron, which had arrived with virtually no ground echelon. The defunct squadron was later reinstated when sufficient reenforcements became available.

In mid-October 1943, the Japanese Army Air Force appeared in strength over the Sumprabum area, determined to harass the air traffic over the 'Hump' route to China, and three of the 311th's A-36As were shot down over this area during a mission on the 16th. Strong attacks on Japanese airfields by P-40 fighter-bombers then brought these intrusions to a virtual halt. Meanwhile, in November, the 530th Squadron of the Group was sent on attachment to Bengal with P-51As, to take part in a series of air assaults in the Rangoon area. D-Day for these raids to begin was 25 November and the P-51As, fitted with long-range tanks beneath the wings, staged through Cox's Bazaar and then escorted B-25s of the 49th Bomb Squadron to bomb Mingaloden Airfield, where two aircraft were claimed destroyed on the ground. A formation of Nakajima Ki-43s of the 64th Sentai was in the air and attacked. The Mustang pilots claimed one shot down and four probables for the loss of two P-51As and two more damaged.

On 27 November, B-24s escorted by P-38s and B-25s escorted by P-51As attacked Insein with excellent results in the face of strong opposition. Ki-43s and Ki-44 of the 64th Sentai together with Ki-45 Kais of the 21st Sentai offered strong opposition, four P-51As being among the nine aircraft lost; the 311th's commanding officer, Col. Harry R. Melton Jr., was one of the pilots seen to bail out. Another raid was made on the 28th without loss, and on 1 December B-24s hit Insein again, while B-25s attacked Myitnge Bridge. Ten P-51As and fifteen P-38s formed the escort, but the Mustangs were late refueling and arrived over the target to find the B-24s and P-38s hard pressed by the 64th and 21st Sentais, this time joined by the 204th Sentai. One P-51A was lost in the ensuing fight, and six B-24s failed to return. During these various combats, two victories were claimed by Lt. J. J. England, later to be one of the 311th's leading 'aces'.

This series of attacks marked the very first use in any theater of the Mustang as a long-range escort fighter on strategic missions, although the first P-51Bs were to fly their first escort for 8th Air Force bombers from England on 13 December 1943—less than a fortnight later! Total losses suffered by the 530th Fighter-Bomber Squadron in this week of operations, however, had been eight P-51As; the unit then rejoined the Group in Assam. Other P-51As had gone into action escorting bombers, albeit on a tactical mission, just before the 530th Squadron flew its first in the series of Rangoon raids. Sixteen 'old and worn' Mustangs had arrived in China from the United States to serve with the 14th Air Force, and these were handed to the veteran 23rd Fighter Group, eight of them joining eight P-38s and 14 B-25s in an attack on Shinchiku airfield on 24 November; no fewer than 42 Japanese aircraft were claimed destroyed, most of them on the ground. More P-51As were to follow this first consignment and the 26th Fighter Squadron of the 51st Fighter Group was also to receive them. In Spring 1944, the 23rd's P-51As were operating in the Chengtu area, and in April these, too were engaged in escort missions to B-24s.

In Burma, meanwhile, 5318th Provisional Unit, a composite group of bombers, fighters, transports, liaison aircraft and gliders, had been set up to support the second expedition behind the Japanese lines of Orde Wingate's famous Chindits. For the fighter element, thirty P-51As were acquired from USAAF bases in Florida, and these were delivered by ship to India, first entering action on 5 February 1944 with a dive-bombing attack on railway targets at Wuntho. On the 14th, thirteen P-51As followed in B-25s which had bombed Zaundaing station, to strafe, meeting ten Ki-43s over the target and shooting down three for the loss of two Mustangs.

During February, the aircraft first carried 1,000-lb bombs in action, the first Mustang unit to do so, and on 2 March, bazooka-type rocket tubes were first used on the P-51s, clusters of three being carried beneath each wing. Great success was enjoyed on 8 March when twenty one P-51As with 500-lb bombs attacked airfields in the Anisikan-Schwebo area; arriving over Anisikan, 17 Japanese fighters were seen on the ground and all 42 bombs were dropped, the Mustangs then strafing. One pilot, Lt. Hubert L. Krug, received credit for destroying five Ki-43 fighters on the ground during this attack, while four covering aircraft drove off 10 more Ki-43s which attempted to intercept. The formation then made for home via Schwebo and Onbauk airfields, where more than 60 aircraft were seen and strafed; final claim for the day totalled twenty seven Ki-43s and six Ki-46s destroyed on the ground, with a Ki-21 and a Ki-43 shot down, plus two probables, all for the loss of two P-51As. Next day, they returned to Onbauk with 1,000-lb bombs, reporting the base totally burnt out on their return.

With the Chindit expedition well under way, six P-51As and eight RAF Spitfires of No. 81 Squadron now moved to an airstrip known as "Broadway" situated behind enemy lines. The Spitfires were to provide air defence and the Mustangs to give close support to the ground columns. On 13 March, Japanese fighters attacked the strip, all eight Spitfires and one Mustang scrambling. They claimed three Ki-43s shot down, but a second Mustang was destroyed by a bomb while trying to take-off. While at 'Broadway', one P-51A was fitted with a U-shaped length of wire, attached at either end to the bomb shackles, from the apex hung another piece of wire to which were attached a number of metal balls. This contraption was used with considerable success to cut Japanese phone lines.



It is June 1943, the Luftwaffe is still attacking all major RAF airfields trying to destroy the RAF on the ground. Flying Officer D. W. Samson of No. 16 Squadron at Middle Wallop prepares to undertake a sortie in his Mustang I, A/C Number AG431. The aircraft is one of the first 320 delivered to the RAF by North American Aviation. Note the .50-caliber Browning machine gun protruding from the lower nose section.

On 29 March, the unit became officially known as the 1st Air Commando Group, and on 6 April, 18 Mustangs made another very successful attack on an enemy airfield. Seven P-51As gave cover while 11 fitted with rocket tubes swept in over Aungban, where more than 40 aircraft were seen on the ground, many in the act of refueling. P-38s had just attacked Heho airfield, and interceptors from there had been ordered to land at Aungban for servicing. In the devastating seven-minute attack, the Mustangs claimed 26 destroyed, two probables and eight damaged, at least one of those destroyed being shot down in the air by Capt. Forcey. The Group continued to cover the withdrawal of the Chindits during April, and late in the month five P-51Bs were received to make good the losses of the five P-51As. In mid-May the unit withdrew to India, where the fighter element was re-equipped with P-47s. The aircraft of the 311th Fighter-Bomber Group fought on, supporting the ground forces in North-East Burma, and by May, while two squadrons remained in Assam, the 528th, with a mixed bag of P-51As and A-36A, had moved forward to a new base in Tingkawk Sakan. In China, too, Allison-Mustangs continued to serve, but Merlin-powered models were becoming available, and as in Italy, so here the Allison versions began to be phased out during the summer of 1944. By the late autumn of 1944, the 311th Group had become a Fighter Group proper, fully equipped with Merlin-Mustangs, and had moved to China. By this date the Allison versions had virtually disappeared from service in the Far East.

A GLOSSARY OF RAF RANKS		
Rank	*Abbreviation*	*U.S. Equivalent*
Pilot Officer	Plt Off	2nd Lieutenant
Flying Officer	Flg Off	1st Lieutenant
Flight Lieutenant	Flt Lt	Captain
Squadron Leader	Sqn Ldr	Major
Wing Commander	Wg Cdr	Lt. Colonel
Group Captain	Group Capt	Colonel

About the Author: Christopher Shores worked for 45 years as a commercial real estate appraiser and investment adviser. In his 'spare time' he authored more than 40 books on military aviation history. He has specialized on WWII fighter operations and pilots. His "Fighters Over the Desert" *(1969) was the first campaign history written in a day-by-day format from both sides, describing what each thought had happened and what had actually happened. With co-author Chris Thomas, he wrote a three-volume history of the 2nd Tactical Air Force in Europe with a fourth volume just released. He is a volunteer member of the Fleet Air Arm Museum at Yeovilton, England. This year being the 100th Anniversary of British Naval Aviation, he has been commissioned by the Museum and the Royal Navy to write the Centenary book which will be published in June. A list of his books may be found on Google.*



The Pleasure of Your Company Is Requested at the
47th Bald Eagles Reunion
to be held on Saturday, April 18, 2009
at the Proud Bird Restaurant
11022 Aviation Blvd. (at 111th Street)
Los Angeles, CA

The Speaker will be:
Robert van der Linden, Ph.D.
Chairman, Aeronautics Division
Smithsonian Institution
Washington, D.C.

Doors Open for Social at 10:00 A.M., Seating for Lunch at 12:00 Noon

Send your check for $25.00 per person, made payable to the Bald Eagles Inc.

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Specify your choice: Prime Rib, Chicken or Vegetarian

For each person for whom you are ordering a ticket, print their first and last name as it should appear on their badge and their meal preference. If no preference is indicated, Prime Rib will be served. Tickets and badges will be issued as you register at the door. Tickets sold at the door will be $28.00. Sorry, no refunds after April 10, 2009.

There are no service requirements to attend – just a smile and a happy disposition.

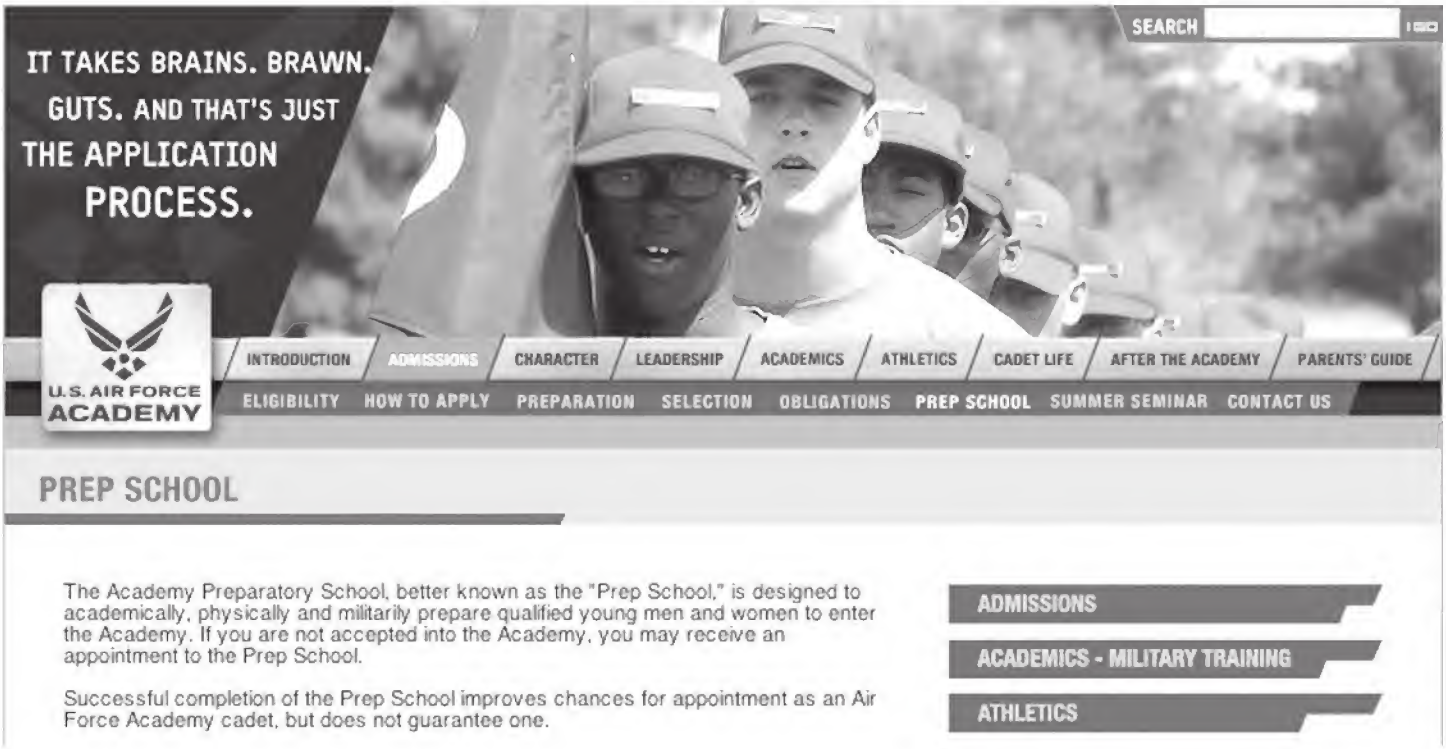
Parking is limited—Carpool and Come Early!

The United States Air Force Academy and North American Aviation

You, our readers, and several thousand other retirees spread over this magnificent nation are all that is left of what was once the greatest aerospace company in the world, North American Aviation. This historical name is quickly getting pushed back into the dusty corners of history along with others such as Fokker, Berliner-Joyce, Curtiss, Bell, Republic, Douglas, Consolidated, Chance Vought, and Vultee. Even our obituaries often identify us only with Boeing although we only served our closing years with that company. For this reason, the volunteer staff of the Bulletin has sought out a way to extend the name North American Aviation beyond our declining years. We thought of establishing a scholarship with UCLA but when that institution was given our supersonic wind tunnel, they turned around and sold it for real estate. Perhaps, one of the best appraisals of what had become of "Our Company" was made by John Moore, the President of Autonetics, in a Spring 2002 article that he wrote for the NAA Retirees Bulletin.

> *"One of the great tragedies of the current high technology era is that the name of what was arguably the greatest high technology enterprise progenitor of this era is no longer known to most of its present beneficiaries. That name is North American Aviation, Inc. (NAA). Even most of us who have been privileged to work together at NAA seldom recognize the importance of the legacies that we have left to the technology, economy and standard of living that exists today.*
>
> *"Indeed, a strong case can be made that without the requirements, priorities and government risk capital, plus, the enterprises that they spawned, the world's standard of living could have taken more than a century longer to reach its present level; the world would have been denied hundreds of millions of important jobs and career opportunities; and world civilizations could have been denied the capabilities to survive current and projected battles against population growth, affordable resource depletion and man's ravaging of the earth's ecosystems.*
>
> *"Furthermore, NAA should not only receive accolade for its many technological firsts and advances in systems engineering; it also made substantial contributions to the management of large, multi-faceted programs and the evaluation of high technology-based business opportunities. How do I know all of this? I was there during those heady days of the 1950s and 1960s when risks were taken and leverage technology was fashioning a new technology-based era."*

Sonnie Robertson, our Membership Volunteer, suggested that we examine the possibilities of a scholarship with the United States Air Force Academy. Through our Air Force friends, we have connected with that institution and found that scholarships are not accepted since the Government covers all basic costs. However, the Academy has individual recognition awards from each department which are sponsored by interested outside parties and it also supports a Prep School on campus which provides an intensive ten month program for those applicants who just did not quite make the cut but are still strong candidates for the Academy. The Prep School is modeled after the Academy but does not have an award program. We have a possible role here as sponsors. Hence, we are currently in an exploration phase with the Academy to find a place where North American Aviation will be best memorialized for many more years to come. The Academy understands what we are trying to achieve and is very willing to pursue this objective with us. Many of you have expressed an interest and a willingness to participate in this endeavor and we shall keep you informed of our progress.



A 20TH CENTURY GUY

by Jim Pearce

SSA Publishers wish to apologize to those of you who ordered Jim's book only to have the Goodyear AZ Post Office return your order. That situation has now been corrected. We would appreciate it if you would resend your order. For those whose order made it through...happy reading!

Jim's autobiography contains *"a lot of flying and a lot of living!"* (NAAR Bulletin, Winter, 2008)

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To get the full value of a joy, you must have somebody to share it with.

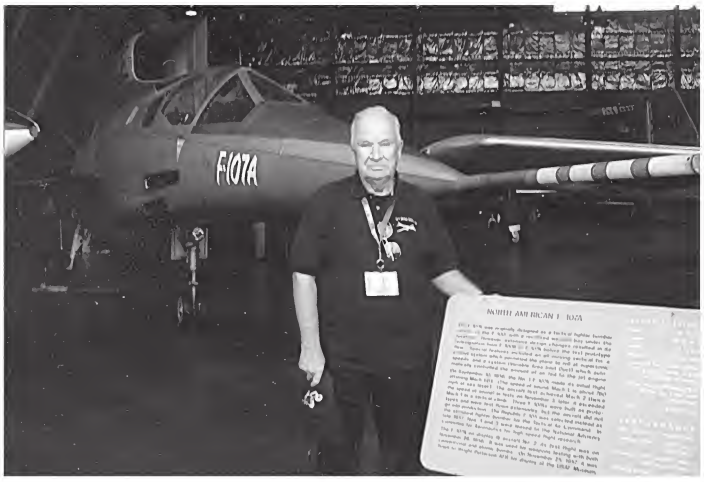
—Mark Twain

Contrails From The Past

by Ed Rusinek

Dear Ed,

Last October, my wife and I attended an Air Force reunion in Cincinnati, Ohio. One of our outings was a visit to the Air Force Museum at Wright Patterson AFB. What a thrill it was to enter the Experimental Building and to see the XB-70 and the F-107!



I was the master layout man on the XB-70 mock-up. I'll never forget the day it was announced that both contracts were cancelled. It was the same feeling I had years earlier while working on the F-93 when it was cancelled. However, the two cancellations actually changed my life!

I previously had been offered a job in Cost Analysis, but could not get a release. Without a degree, it would have been a big step for me to get a salaried position which normally required a degree. With the cancellations, I received the transfer, wound up at Autonetics and moved to Orange County.

I'll never know what my future would have been had I stayed in LAD, but I had a great experience at Autonetics and have no regrets except for that wonderful bird, the XB-70 never making it to production.

—William E. Wells, Orange, CA

Ed's Ans.: The XB-70 was so far ahead of its time that the simple bobble head sitting in the White House could not comprehend the immensity of the leap forward that the aircraft generated.

Dear Ed,

The article on the acquisition of the Curtiss-Wright Columbus plant was of interest to me because I had worked there during the war years as a project engineer on the Curtiss SB2C Helldiver.

In 1951, I was working in the Special Projects Group for Gene Salvay. He asked me to return to Columbus for six months to indoctrinate the Columbus engineers in NAA Engineering Practices. My answer was a resounding yes.

To start, we had to design a Tow Target package to fit into the bomb bay of the Navy AJ3. The preliminary design had already been done at LAD by Norm Surtees and detail design was to be done at Columbus. I arrived and went to work on the detail design. The six months went by in a flash!

When Columbus had been awarded a contract for the Navy T2J trainer, LAD became involved as part of the Design Team responsible for the design of the wing, empennage, and canopy. Again, Gene assigned me to lead the project and I returned to Columbus to pick up the preliminary design and to finish the detail design at LAD. Thank you for a great article.

—Les Hall, Sherman Oaks, CA

Ed's Ans.: Your letter reflects the NAA Spirit that every person had working at NAA. No assignment was too hard, too far or too long. You went, you did, and you stayed until it was done!

Dear Ed,

Your book excerpt and review of *"A 20th Century Guy"* by Jim Pearce stirred many memories. On May 19, 1960, I had my first flight in the *"Vigilante"* A3J-1, No. 8, piloted by Jim Pearce. On this introduction to Columbus Flight Test, I had the challenging task of toggling an on/off switch which operated an oscillograph to record various test points in an acceleration to Mach 2. Since my only previous experience with jets was a SAC EB-47E, going to Mach 2 in that time frame was a rather remarkable experience.

This flight was followed by many others, totaling some 2,000 hours, in which I rode "shotgun" with a host of outstanding NAA test pilots as we developed versions of the A3J to the RA-5C.

This career ended some 27 years later when Chief Test Pilot Ed Gillespie and I closed the door of Columbus Flight Operations with the fly-out of two special edition OV-10D aircraft. Of all the exciting events that transpired in that time, my first flight with Jim Pearce remains the most memorable.

—Andy Kendall, Gahanna, OH

Ed's Ans. Thank you for a great follow-up story!

Dear Ed,

Last June, to celebrate my 90th birthday, I flew over the Phoenix area in a restored B-24 one day and in a B-25 the next. It relieved a desire to fly in the products I helped design: specifically, the early B-25 at LAD in 1940 and the B-24 at the Dallas division in 1943.

You may have noticed the two tubes protruding from the trailing edge of the B-25 engine nacelles. Those were the fuel system climb and dive vent outlets. They were the first production detailed drawing which I made in John Young's powerplant group at LAD. This was accomplished at my starting wage of 54 cents per hour which my supervisor said was slightly higher than the normal entry wage.

—Warren Bratfisch, Mesa, AZ

Ed's Ans.: It is amazing what was accomplished in those days for the wages paid. Today, a man on the production line can only tighten a bolt for $30.00 per hour and can't or won't accept any other task because it is outside of his assigned work classification.

The Silent Majority

by Stan Guzy



KANY, JULIUS A., "JULI", 95 – of Solana Beach, CA passed away on January 18, 2009 and a bit of history passed away with him. Julius was the last living member of the original North American Aviation Bald Eagles that joined "Dutch" Kindelberger in making the trek from Dundalk, Maryland to Inglewood, California. He was a tool designer and retired as a manager in Tool Design in 1975 after 40 years of distinguished service. In death, he joined his loving wife of 67 years, Bonnie, who passed away three months earlier. We salute Julius Kany as a pioneer of North American Aviation.

ACHEE, EMILE W., 81 – passed away on November 11, 2008 from undisclosed causes. Emile was a graduate of the U.S. Naval Academy and served with distinction in the Korean Conflict. Leaving active duty in 1955, he went into engineering and marketing assignments with Collins Radio and RI/Autonetics. He had been the General Manager for RI in Germany GMBH and experienced a highly successful career holding several senior executive positions before retiring in 1992. He is survived by his wife Joan.

BARLOW, CLAYTON G., 1st LT, USAF (RET), 88 – He passed from this life on November 3, 2008 from undisclosed causes. After serving over 20 years in the USAF, Clayton joined RI as an aeronautical engineer and worked on various programs including the F-5 Project and other missile projects before retiring in 1985. He is survived by his wife of 63 years, Viola.

BLAIR, HUGH R., 77 – of Moreno Valley, CA passed away on January 21, 2009 in Riverside, CA. After returning from the service Hugh joined NAA/RI as a skilled machinist and tool maker. He retired after 37 years of service. His loving wife of 40 years, Lupe, survives him.

BROWN, EVERETT T. "JAKE", 87 – of Santa Maria, CA, died on January 6, 2009. A veteran of World War II, he was one of the scientists on the Manhattan Project at Columbia University that helped split the atom. He joined NAA in 1956 and retired in 1981 as Assistant Vice President at Autonetics/SSD with 25 years of service. He is survived by his wife of 65 years, Violet "Scotty".

DAGAND, ROBERT W., 85 – passed away of Alzheimer's disease on April 25, 2007 in Long Beach, CA. Bob served for 40 years in Contracts & Pricing before retiring in 1996.

DICKS, JAMES "TED", 72 – passed away at his home in Corona, CA on January 4, 2009. He had worked at the Autonetics Marine Systems Division for many years and even played on the Autonetics Baseball team. He is survived by his wife of 49 years, Barbara.

DOPHEIDE, NEIL, – was reported to have expired on January 28, 2009 from undisclosed causes. Neil was a Director of Purchasing at Autonetics at the time of his retirement and has been a Board Member of the Bald Eagles for a great number of years. No further information is available.

DORN, PHILLIP F., 83 – of Dewey, AZ died on December 5, 2008 at the Acts of Kindness Care Home in Prescott Valley, AZ. He retired from LAD in 1985 after 32 years of service. He is survived by his wife of 46 years, Annella.

DZURICA, JOHN L., 78 – passed away at St. John's Hospital in Santa Monica, CA on November 30, 2008 as a result of a brain tumor affliction. John had retired from LAD Structures Engineering in 1994 having worked on the B-1B data delivery system and completing 29 years of dedicated service.

GARDINER, CHARLES L. "CHUCK", JR., 76 – passed away at his home in Rancho Mirage, CA on December 31, 2008. Chuck joined Autonetics after leaving the Air Force. His area of expertise was in Contracts and Pricing and was involved in many projects during his tenure with the company. He retired in 1988 after 25 years of service. Burial was at the Riverside National Cemetery. He is survived by his wife of 23 years, Kathy.

HILL, HOWARD R., 91 – of San Jacinto, CA died at Hemet Valley Community Hospital on December 30, 2008. Howard served in engineering planning at Palmdale and LAD for 23 years before retiring in 1972.

HOGUE, LEWIS "JACK", 88 – died on December 27, 2008 with his family at his bedside after experiencing a disastrous fall. Jack began his career at NAA/RI as an inspector in the fabrication area. He served as an inspector on the Sabreliner, Minuteman, Apollo and Shuttle programs. He took early retirement in 1980 due to loss of vision. Jack was predeceased in 2003 by his loving wife of 32 years, Rose Mary, also an NAA/RI employee.

JONES, THOMAS C., 76 – of Palmdale, CA passed away on January 11, 2009 after suffering a heart attack. He began his career with NAA in 1958 as a Tech Writer and progressed to GSE Design, then to Test Engineering on the Saturn Program. He earned an engineering degree from CSU Long Beach and a Law degree from Southwestern School of Law. He supervised a Material Contract compliance group on the Shuttle program and eventually provided support for the B-1 program at Palmdale. He is survived by his wife, Doris.

McKENZIE, KIRKLAND E., 67 – passed away in the latter part of 2008 from undisclosed causes. He was the eldest of seven children and excelled in academics and sports throughout high school and college. After serving in the Air Force, Kirk later began a career which spanned over thirty years with NAA/RI where he demonstrated tenacity and professionalism which enabled him to advance to the position of Director of Human Resources. Kirk leaves his loving wife Betty to cherish his memory.

METSA, ROBERT "BOB", 82 – died peacefully, surrounded by his family and close friends, on November 13, 2008 at St. Jude Hospital, Fullerton, CA after complications with cancer. With an MS in Aeronautical Engineering he had a distinguished career with NAA/RI for 30 years before retiring in 1988. Robert cherished many long

lasting friendships he made throughout his career. He is survived by his loving wife of 23 years, Clarajane, and his immediate family.

MUCHMORE, CLARENCE H. "MUCH", 80 – of Henderson, NV passed away on January 9, 2009 as a result of an aneurysm. "Much" joined LAD in 1951 as a design engineer and retired in 1977 with 27 years of service on the X-15, XB-70, B-70, and the B-1 programs. He is survived by his loving wife Gloria. She also served at NAA in Flight Test.

MUNSON, ROBERT W., 88 – passed away in his home in Hemet, CA on November 22, 2008. Bob retired from Space Division in 1982 after 42 years of service. Very active as an instructor in the Boy Scouts of America for 15 years, he was recognized with the presentation of the Silver Beaver Boy Scout Award. He is survived by his loving wife of 59 years, Genevieve.

NELSON, WILLIAM E. "BILL" – of Garden Grove, CA, Winter 2008 Issue of Bulletin returned stamped "Deceased". Bill retired from Space Division in 1989 after 42 years of service.

O'BRIEN, RICHARD J., 83 – of Anaheim, CA passed away from undisclosed causes on December 24, 2008. Richard enjoyed a 43 year career at NAA/RI before retiring. He loved flying and was a devoted Angels baseball fan. Richard married Elsie and was a testimony of enduring love in a life-long marriage of 60 years.

PINCKNEY, DAN S., 84 – of Oakhurst, CA died on January 15, 2009. He was a retired financial manager at NAA/RI. Dan is survived by his wife, Pat, who was also employed at NAA/RI.

POMYKATA, JOSEPH M. "JOE", 94 – passed away in Bishop, CA on December 20, 2008. Joe served in the USAAF from 1941 to 1946 and flew numerous missions over Europe. He worked on the development of radio controlled B-17s to be used to destroy German submarine pens on the French coast and was assigned to Wright Field where he was responsible for the design, development and flight testing of air and ground launched missiles. After the war, he worked on the design of the Nike missile at Douglas and the Snark guidance system at Northrop. He joined NAA on the X-10 Navaho and held various management positions on the GAM-77 Hound Dog, Minuteman guidance and Apollo GSE. He was a good friend.

RUTHERFORD, CHARLES W., 81 – died on January 23, 2008 in Pickerington, OH from undisclosed causes. Charles was an NAA/RI retiree and had worked as a project manager on the Space Shuttle program. He is survived by his loving wife Bette.

SIVERT ROGERS, MARCELLA, 84 – of Mira Loma, CA passed away on December 31, 2008. Born in Texas, she moved to Southern California in 1947 and retired from Rockwell International in 1990 after 32 years of service.

VENLET, ROBERT L., 81 – died on June 30, 2008 from undisclosed causes. He had been a Material cost analyst with NAA/RI during the shuttle program and many other projects before retiring with 31 years of aerospace service.

VOSHART, ELDON L. – of Columbus, OH, died on November 13, 2008. A Navy veteran, Eldon retired from the Columbus Division in 1980 with 30 years of service. He is survived by his loving wife of 63 years, Alberta.



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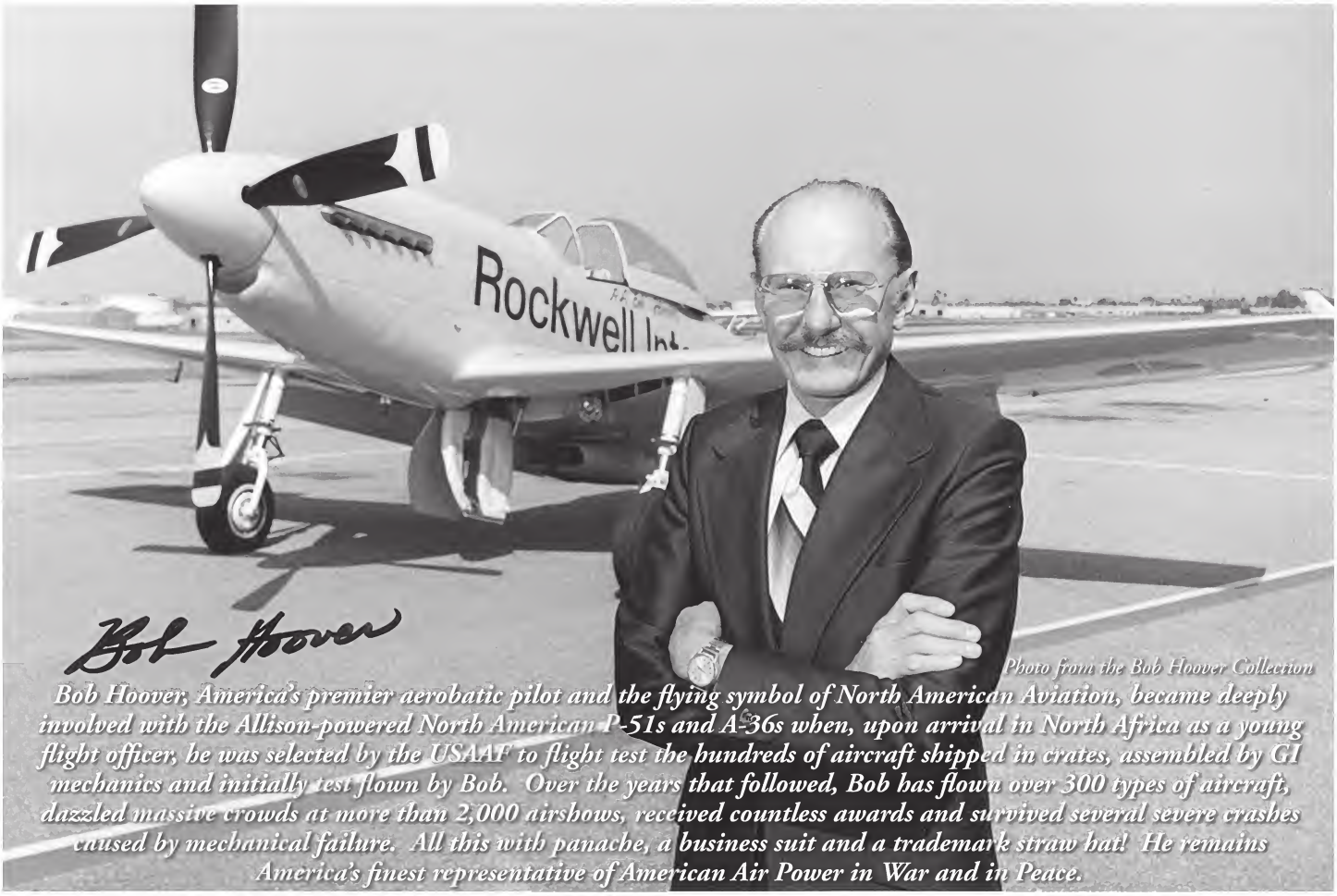


Photo from the Bob Hoover Collection

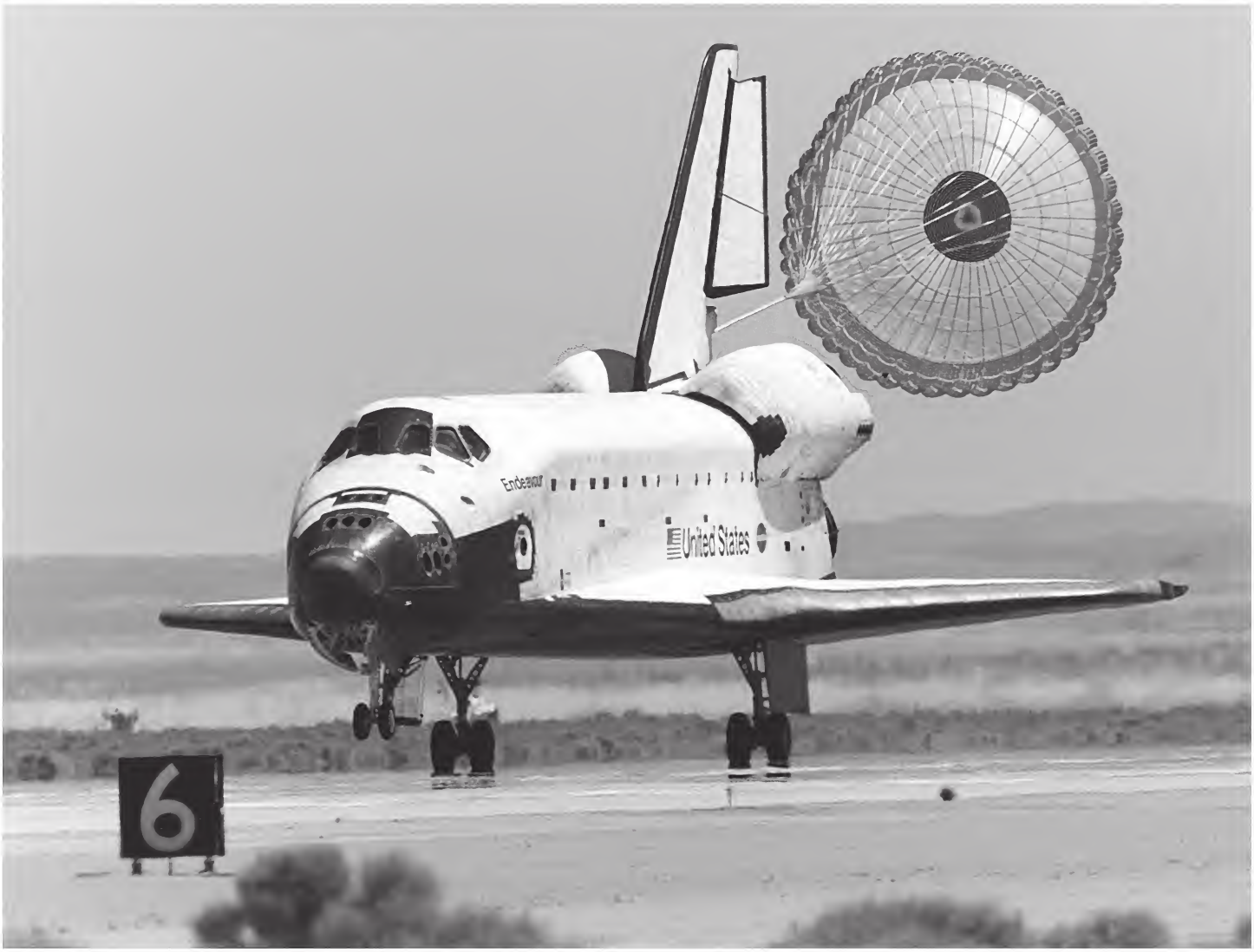
Bob Hoover, America's premier aerobatic pilot and the flying symbol of North American Aviation, became deeply involved with the Allison-powered North American P-51s and A-36s when, upon arrival in North Africa as a young flight officer, he was selected by the USAAF to flight test the hundreds of aircraft shipped in crates, assembled by GI mechanics and initially test flown by Bob. Over the years that followed, Bob has flown over 300 types of aircraft, dazzled massive crowds at more than 2,000 airshows, received countless awards and survived several severe crashes caused by mechanical failure. All this with panache, a business suit and a trademark straw hat! He remains America's finest representative of American Air Power in War and in Peace.

NORTH AMERICAN AVIATION
Retirees Bulletin

Summer 2009

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MUSTANG – THE TRUE BIRTHRIGHT by Lowell Ford
NAA AWARDS AT THE U.S. AIR FORCE ACADEMY by Ed Rusinek



NASA Photo

Space Shuttle* Endeavor *completes its maiden mission, STS-49, landing on Runway 22 at Edwards Air Force Base on 16 May 1992. It was the first exercise of Development Test Objective (DTO) 521, Orbiter Drag Chute System, deployment of the drag chute. The mission was extended to nine days to retrieve the Intelsat VI satellite, which failed to leave low earth orbit two years earlier, attach it to a new upper stage in the payload bay, and relaunch it into geosynchronous orbit.

NORTH AMERICAN AVIATION
Retirees Bulletin

North American Aviation Retirees Bulletin, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

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Dear NAA Retirees Bulletin Subscriber

Well, it is done! After an amicable discussion with the United States Air Force Academy, your North American Aviation Retirees Bulletin has arranged to sponsor three outstanding scholar awards at the Academy and one at the Academy Prep School. The awards will be made starting in 2010 and will be presented each year in perpetuity. To accomplish this, the Bulletin volunteers reached deeply into our contingency fund to establish a trust fund for each award. The interest earned from these trusts will provide the actual awards presented to the cadets and the cadet candidate. These awards are usually sponsored in the name of an outstanding person. Our awards will bear an unusual cachet in that they will be sponsored in the name of a company. They will be the final salute to a great company, Our Company! They will salute North American Aviation, Inc. We think it is only appropriate that the name be connected to young people who have volunteered to serve and defend their nation in the skies and the heavens!

In this issue we have an old friend, Chuck Lowry, discussing the development of the Shuttle Drag Chute. Readers will recall Chuck's article about the Apollo chutes. He is the world's most knowledgeable engineer on parachute design and his description of the idiosyncrasies of individual parachutes provides a ready lesson on parachute design. Every parachute seems to have a "life" of its own. As a result, there are so few technical references available that the engineering almost becomes a "black art".

The new historian at Edwards AFB has agreed to provide us a series of articles on the first flight tests performed at EAFB of North American aircraft and missiles. For his first article he chose the X-10. This brought back several memories which are dutifully reported in a small sidebar.

We also have a very neat article by another old friend, Stan Barauskas, on the Quarter-Scale Space Shuttle Model that was used to conduct vibration tests of various Space Shuttle configurations at the outset of the Space Shuttle program.

Finally, we asked our P-51 historian, Lowell Ford, to comment on Christopher Shore's article. His reply ended up being an article that complements the one provided by Christopher so we are pleased to present it in this issue.

One of the greatest joys of being the volunteer editor of the Bulletin are the fantastic people that cross your path. Some are associated in some manner with North American Aviation but others are simply people with "heart". Perhaps, they recall the roar of a P-51 overhead, the tingling whine of an F-86, or the thunder of a Space Shuttle leaving the pad. Whatever the reason, when asked to help they only reply, "When do you need it?" God Bless them all.

Flight Testing the North American Unmanned X-10 (October 1953 - February 1957)

by Craig Luther, Ph.D.

Since Captain Chuck Yeager blasted through the "sound barrier" in the Bell Aircraft Corporation's X-1 in October 1947, Edwards Air Force Base (EAFB) has become synonymous with the famous "X" series of experimental flight research aircraft. Throughout the decades these aircraft were designed to explore the unknowns of flight and solve their mysteries. Many of them, such as the X-1, were rocket airplanes built to probe and expand the frontiers of flight in terms of speed and altitude; others, like the X-5, the X-13 and, more recently, the X-48A were designed to evaluate new concepts and technologies which might be applied to future aircraft designs.

One of the more unique "X" craft tested at EAFB over the years was the unmanned X-10, built by North American Aviation, Inc., to support the SM-64 Navaho missile program (Project MX-770). The Navaho cruise missile program had begun in 1946, and signified one of several post-World War II missile research efforts undertaken by the U.S. Air Force. The objective of the program was to determine if an intercontinental weapon – such as Nazi Germany's planned A-9/A-10 New York rocket – was indeed possible. The basic mission of the X-10 was that of an aerodynamic and systems test bed for the upper, second-stage cruise component of the Navaho missile.

Specifically, the X-10 was to serve as a test vehicle for operations at supersonic and subsonic speeds to ascertain stress, temperature, guidance, control and aerodynamic conditions which were to be met by operational missiles. The X-10 was also evaluated as a cruise missile candidate on its own merits, to be armed with a nuclear warhead and capable of taking off and flying to a target under its own power. Finally, serious consideration was given to making the X-10 into a ramjet engine test bed; yet intake design limitations and simple economics led to the demise of this proposal.

A total of 13 X-10s were built by North American at the Downey facility; of these, only 10 would be test flown. The basic design was a low delta-wing canard configuration with side air inlets. The "futuristic" looking X-10 sat on tri-cycle landing gear and featured a pair of twin vertical stabilizers, canted outward – a configuration common today but unknown in the early 1950s. A pair of canard wings extended from either side of the craft's long nose and its lithe, sleek lines – unbroken by a cockpit – suggested an air vehicle capable of unusually high speeds. Far aft, the robust engine section with its dual air intakes hinted at high levels of engine power.



Photo from the EAFB History Office

The X-10 inside one of the two hangars located on the flight line at South Base at Edwards AFB and shared with other X-planes.

Two Westinghouse XJ40-WE-1 engines were accepted and installed in the first X-10 and used for ground run-up, rehearsal flights, and first flights. These engines were rated at 10,100 lbs. static sea-level thrust (in contrast to the 10,900 lbs envisaged in the original specifications). In its later configuration, the X-10 was powered by two Westinghouse J40-WE-1 afterburning turbojets – each rated at 10,900 lbs. thrust in full afterburner and 7,250 lbs thrust in military power. Normal rating was 6,500 lbs of thrust.

The X-10's airframe was constructed largely of aluminum, with some magnesium parts in appropriate places. To address heat concerns, stainless steel was used in the empennage section around the power plant compartment, while internal structural assemblies were manufactured of machined and cast aluminum and magnesium. The turbojet power plants were installed in two nacelles blended with the after body.

Following static ground tests by the contractor, the first flight-ready X-10 was trucked to EAFB in May 1953. A large portion of the program activity at Edwards was devoted to ground functional tests which were necessary to establish the proper operation of equipment; and, following delivery of the first test article, an initial period of three months was used to conduct a complete checkout of all systems. Two successful taxi tests were also completed with the first X-10 to provide intermediate operational tests of both equipment and control procedures prior to flight.

These vigorous preparatory efforts culminated in the first flight of North American's X-10 on 14 October 1953. The initial flight had been planned to take place a week earlier, but was cancelled following failure of the radio control system. Now, in the final hours before the flight, contractor technicians worked feverishly to ready the craft's control system, in the process replacing and testing a voltage inverter unit and replacing a burned-out alternator. As the day approached its end, the technicians finally completed their work and the X-10 was again ready to fly.

With all systems "go" and weather conditions ideal, the X-10 roared down its lakebed runway and lifted off the ground. The objective of this initial flight was to determine the air vehicle's flight worthiness and its flight characteristics at subsonic speeds. The test article for this flight was GM-19307, or X-10 No. 1. Following launch, the missile became airborne at a speed of about 160 knots and climbed for altitude. During the flight it reached a maximum speed of 350 knots and an altitude of about 21,000 feet. The X-10 was controlled by a ground controller and a Lockheed ET-33A chase plane. The ET-33A was outfitted with a complete radio control system, enabling it to control the X-10 during takeoff, cruise flight and landings. The Lockheed chase plane then shepherded the missile back to Edwards Air Force Base for a perfect landing.

The X-10 had flown 172 miles and remained airborne for about 32 minutes. From the perspective of the test team, the flight was a success; simply stated, it verified control system data which had been obtained from the three conventional surrogate aircraft assigned to the program: the ET-33A; the Lockheed QF-80C drone; and the North American F-86D, which had been equipped with a prototype PIX10 autopilot. The second flight of the X-10 followed several months later, on 5 December 1953. The purpose of this test mission was to evaluate the ground control system and out-of-sight operating techniques. The flight lasted 35 minutes and 18 seconds, with the X-10 climbing to 24,400 feet and attaining a speed of Mach 0.71. All test objectives were met.



Photo from the NAA Retirees Bulletin Archival File

The first Navaho X-10, GM-19307, was trucked to Edwards AFB in May 1953. In the process of lifting the missile off the truck bed, the crane's clutch slipped and dropped the vehicle back on the truck bed. The main landing gears became wedged in the truck bed and it required dismantling much of the truck to finally release the vehicle. After undergoing extensive testing in the hangar, the X-10 stands proudly on the lakebed, poised for flight. Encountering several delays, failures and countdown aborts, GM19307 finally roared down the runway on October 14, 1953 and flew successfully for a total flight time of 31 minutes, 40 seconds and a distance of 195 miles.

With X-10 flight testing underway, the Air Force was looking ahead to a time when unmanned high-speed missiles could be employed to strike hostile forces without risking interception from enemy fighter aircraft. One candidate was North American's XSM-64 Navaho. This was envisaged as a supersonic ramjet with a range of 1,500 miles, to be launched vertically by means of a large, liquid-fuel rocket booster. The concept was extremely advanced for the early 1950s; the technological challenges formidable. As a result, the Air Force specified a supersonic turbojet test bed as the first step: the X-10.

At Edwards AFB, technicians marked off a 21,000-foot runway – 07/25 – at the far south end of Rogers Dry Lake. There, several X-10 test articles completed a total of 15 successful flight tests through March 1955, with 10 of these missions contributing to the attainment of primary test objectives. Indeed, the airworthiness of the basic X-10 airframe, power plant and overall configuration was successfully demonstrated for subsonic conditions throughout the 15 flights, while airworthiness and equipment operation in the supersonic regime was successfully demonstrated during Flights 4, 8 and 10 at Mach numbers up to 1.84 on the 10th flight, on 28 September 1954. In general, mission performance confirmed design specifications under the test conditions encountered. For example, a series of test maneuvers – including acceleration from Mach 0.9 to Mach 1.84 and a two g pull-up at Mach 1.84 – verified the structural integrity of the design.

In March 1955, the long-pending decision was made to transfer all X-10 assets from EAFB to the Air Force Missile Test Center (AFMTC) at Cape Canaveral, FL. Testing there commenced in August 1955 and continued through early February 1957, when the X-10 completed its 27th and final flight. On its 19th flight (at AFMTC), the North American missile reached a maximum speed of Mach 2.05, setting a new speed record for a turbojet-powered aircraft. While the original X-10 program had envisaged 40 test flights, technical difficulties with the SM-64 Navaho missile – coupled with the development of more sophisticated ICBM designs – led to early termination of the X-10 flight test effort.

Nevertheless, the X-10 was successful in achieving its primary design objectives, in the process making vital contributions to the Navaho missile program. The unmanned X-10 verified the aerodynamics of the upper, second-stage vehicle and the hardware associated with its sophisticated navigation package. Indeed, the operational test flights validated the system's telemetry, autopilot, auto approach and landing systems, helping to build a technology base for the remote control of high-performance aircraft. The X-10's twin vertical stabilizers proved optimum for sustained high speed flight, and the concept has been used extensively ever since. Finally, the X-10 had the unique distinction of becoming the world's first Mach 2.0-capable turbojet aircraft to be employed as a target drone.

About the Author: Dr. Luther was a Fullbright scholar in Germany. He received his Ph.D. from UC Santa Barbara in 1987. He has written several books on German military history and has served as USAF historian since 1984. His first assignment was at McClellan AFB. Since 2000, he has been an Edwards AFB historian.

X-10 Memories of Edwards AFB

The photo of the X-10 in the hangar at Edwards AFB provided by Dr. Luther brought back some vivid memories of another time, another life. In 1953, I was an engineer in Downey working in the Stress Group on the Navaho program. We were all working on the G-26, the second version of the Navaho. The first version of the X-10, were still being assembled out in the shop and I was assigned to resolve all structural issues out on the production line. All of the other engineers gave me their stress analyses which I kept in note books by part number.

The first X-10, Tail Number 19307, had been delivered to Edwards in May and was being checked out for test flight by NAA field personnel.

One Friday afternoon in June, my supervisor, Chuck Rose, called me over and informed me to pack a bag on Monday because I was going on a trip to Edwards AFB. Evidently, to save time in case an emergency arose, a Stress Engineer was requested to be on standby at Edwards. On Monday, I reported to the flight line at Downey. The dispatcher checked his manifest and waved me aboard the C-47 which had been recently bailed from the Air Force. The interior was still paratrooper ready with metal seats running the length of the cabin.

The pilot came aboard, knelt down and pulled up the ladder and slammed the cabin door shut. He announced, "Everyone put on a parachute!" Since this was my first trip, he showed me how to strap the chute on and where the ring was in case I had to jump. We settled down. The pilot climbed into the cockpit and after a brief warmup, we were airborne. For three months I made that flight every Monday morning only to be returned every Friday evening. Except for my name on the manifest, I don't think there was any record of me ever being on the aircraft.

We landed at Edwards and taxied over to the Flight Ops shack. I checked in and was assigned a room in the Bachelors Officers Quarters (BOQ). The airfield consisted of two giant hangars, the Flight Ops shack and the BOQ located on this vast dry lake. Some distance away was the formal military base. I dropped off my bag in my room and reported to the hangar where the X-10 was undergoing testing. It was like entering a World of X-Planes!

Our hangar was a fantastic array of historical aircraft. Next to the X-10 stood the record breaker Bell X-1A, behind stood the Douglas XB-43 jet bomber. It was the jet version of the very unique XB-42, known as the *"Mixmaster"* because it had two contrarotating propellers located behind the tail. Another unusual plane in the hangar was the Northrop X-4 *"Bantam"* hi-speed tailless experimental aircraft. To complete this medley of speed machines was a North American Aviation F-86D equipped with a PIX10 autopilot, a Lockheed QF-80 radio controlled drone to test the X-10's radio control and a Lockheed ET-33 to control the X-10 during takeoff, flight and landing. It was exhilarating just to stand in the midst of all these magnificent flying machines!

I must add, it was not all work and no play! An NAA colleague stationed at Edwards took me to the Officers' Club one evening where I met the newest NAA test pilot hired from the Air Force and his charming Australian wife. His name was George Welch. We also went for dinner to "Pancho's" where I met the famous or infamous aviation pioneer Florence Lowe "Pancho" Barnes.

—Ed Rusinek

The Space Shuttle Orbiter Drag Parachute

by Charles H. Lowry

It all started with Astronaut John Young. John had commanded the Apollo 16 Lunar Mission and was standing on the surface of the Moon when he heard the official announcement that the Space Shuttle Program was to move forward. He was soon volunteered to command and fly the ALT (Approach and Landing Test) flights in which the Enterprise (first Orbiter, capable of atmospheric flight only) was to be carried to altitude "piggyback" on top of the NASA 747, released, and flown dead-stick back to base and landed. He did it well and made it look easy. John became a powerful voice in the early days of the Space Shuttle. And he knew more about landing the Orbiter than anyone. After the ALT program, he was entrusted to fly the first Shuttle orbital mission. A very competent and gutsy guy.

John's voice continued to be very important in the following years as the Shuttle matured and served the nation. After the Challenger disaster in 1987, the Rogers Commission was established by President Reagan to manage the determination of failure cause, corrective action, and steps back to resumption of flight. Its charter also included a broad examination of safety issues across the program to ensure safety through all phases of operation, reminiscent of the huge effort that followed the fire on Apollo 1, 20 years earlier. John Young had much to say to the Rogers Commission, and people listened.

After 25 successful landings and then the Challenger accident, John's widely-distributed letter of January 26, 1989 in which he stated, *"Many people believe the **next** Space Shuttle accident will be in the landing phase"*, and *"The United States is betting the Space Shuttle Program on the crew's ability to perform with an Orbiter Landing and Rollout System that is, at best, intolerant of routine aircraft operating problems such as single tire leaks, nosegear steering malfunctions, or unexpected crosswinds."*

As a result of that letter and other forces, studies were conducted at NASA and Rockwell to determine the feasibility of installing a drag chute on the orbiter, and what it would look like. Should it be a single chute (like on most fighter aircraft) or a cluster of 2 or 3 (like on the B-70)? What kind of system would be needed to deploy and inflate it behind such a large fuselage? What kind of exotic textile materials would be required to put it in an acceptable range of weight and volume?

Perhaps the biggest initial concern was the huge aerodynamic wake behind the landing Orbiter, which would tend to inhibit the ability of a parachute to deploy, solidly inflate, and provide the needed drag. There was this huge forebody with a blunt aft surface, high angle of attack, elevons, and speed brakes; a hostile environment in which to deploy a parachute. What if it didn't inflate?

If that's such a big problem, what about bringing the Orbiter home like we did so successfully on Apollo? Naaaw! Maybe not.

A drag chute had been a part of the original Orbiter design, but to save weight had been deleted along with its stowage provisions early (1974) in the program. Finding a place to stow this newly conceived addition became a major problem. There were a few "nooks and crannies" around the vehicle, but could they be used? Many possibilities were examined.

In reality, a parachute must be installed and deployed from a point aft on the structure to ensure no recontact with the structure as it deploys and trails back. The options were limited, but a suitable place was eventually created on the vertical tail above the 3 main engine bells and below the speed brakes.

The best choice for the Orbiter drag parachute was determined to be a single conventional ribbon canopy similar to the SR-71 (40 ft diameter), but with extensive use of Kevlar (in place of Nylon) in the structure of the chute to save weight and volume. Also certain shaping modifications were incorporated to improve the efficiency of the drag-producing canopy.

The ribbon parachute is widely used in many applications. It was developed in Germany during the 1930s and its drag surface is made up of 2-inch wide Nylon ribbons. Actually the inventor, Theo Knacke, built his early chutes from hatband material, which happened to be 5 cm in width—we call that 2 inches. Theo actively consulted with us in the development of the Orbiter drag chute.

A pyrotechnic mortar was designed to fire and deploy a small (9 ft diameter) pilot chute into clean air far behind the Orbiter, so it could pull the main canopy aft of the severe wake region for positive inflation and good drag.

Wind tunnel tests were conducted to determine how far aft need the parachute canopy be to produce respectable drag, and a riser length of 87 ft was shown to be satisfactory. With a maximum deployment velocity of 230 knots, the maximum design load of 100,200 lbs with dispersions was established.

The Vertical Motion Simulator (VMS) at NASA's Ames Research Center produced some of the most revealing information on usage of the drag chute. This is the 6 degree-of-freedom facility where much of the astronaut training for landing was and is conducted. It has a high-fidelity cockpit with flying qualities like the Orbiter. The VMS was the perfect tool to evaluate the drag chute and to develop landing procedures. It could simulate wind conditions and failure conditions such as control system problems and blown tires.

The Orbiter normally touches down and rolls a long way with its nose high. It was desired to deploy the drag chute as early after touchdown as possible to make it most effective. But since the riser is attached to the Orbiter so high on the tail, the sudden application of a high drag force at that high attach point tended to pull the nose even further up, increasing the angle of attack and causing the landing Orbiter to skip off and go airborne again. Not good.

So reefing was incorporated into the parachute design to allow early deployment while limiting the force fed into that high point on the structure. Reefing allows the canopy to inflate only to a certain diameter, then after a preset time delay (and further slowdown) allows full inflation. This configuration and the technique of initiating chute deployment after main gear touchdown and just as the nose starts to drop (derotation) were adopted. After initial reefed inflation, the Orbiter decelerates for 3.7 seconds and then the chute is disreefed and allowed to fully inflate. In this manner, the maximum load applied to the Orbiter is controlled and limited. The VMS was used to develop and validate this configuration. The chute is kept attached until the Orbiter slows to 40-80 knots, when it is jettisoned.



The parachute stowage compartment is ideally located in the tail section of the Orbiter, where the airstream passes on either side of the compartment and aids in the deployment of the door and pilot chute. The pilot chute mortar faces aftward. When it fires, it shears the rivets that hold the metallic cover on and the pilot chute then proceeds to full stretch and inflates in about 1.0 sec. The force produced by the inflated pilot chute (about 4,200 lb) applies tension to the 2 cut-knives that sever the Kevlar cords holding the main chute pack in the compartment. The main chute pack is then accelerated aftward at 30 to 40 g, so clearance with the main engine bells is assured.

Before all that happens, the compartment door must be removed. The door has a unique jettison feature whereby it swings open on breakaway hinges by force from firing the mortar. The door is just a lightweight aluminum machining with TPS on it. Strangely, the machining ended up looking just like the door on the Design Group repro machine.

The door swings open under the force of the pilot chute pack emerging from the mortar to approximately 45 degrees at which point the hinges disengage and the door becomes a free-flying projectile. The hinge breakaway point is carefully defined to ensure the door trajectory carries it aftward (relative to the Orbiter) between the starboard OMS engine pod and the main engine bells, ensuring no contact. The door then trails the Orbiter and frisbees along behind it until it hits the runway.

The pilot chute mortar is fired by a single cartridge with dual electrical initiation. The muzzle velocity is in excess of 150 ft/sec, which ensures the pilot chute is carried well beyond the area of extremely dirty air trailing the fuselage so that positive pilot chute inflation will occur. The entire process from mortar initiation until full main chute inflation is about 5 seconds.

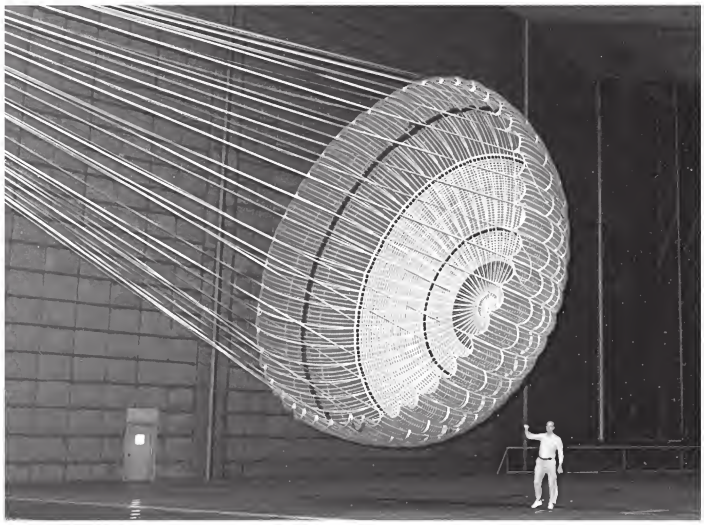
The parachute system including the compartment and door, was flight-certified by 8 deployments behind a landing B-52 at



Dryden. Obviously we could not duplicate the blunt forebody, high attach point, or even the maximum landing velocity, but deployment, inflation, reefing, and door behavior were verified by those successful tests prior to installation on the Orbiter. The first Orbiter landing with the drag chute was STS-49 on May 16, 1992.

An interesting problem in parachute technology came up after a few flights. Our inability to initially test the drag chute system in a wake environment simulating the Orbiter led to a problem with parachute stability. The parachute canopy was originally designed with a low porosity to ensure positive inflation in the extreme wake field trailing the landing Orbiter—Parachute designers never, never, never want to field a career-ending chute design that fails to inflate. Low porosity encourages inflation in a strong wake field so we leaned that way. But low porosity also causes a parachute to want to fly at an angle displaced from the direction of airflow and that seemed to be the instability we were experiencing. On the early Orbiter flights the drag chute was found to seek out a stable position of about 7 degrees to one side or the other, causing extra pilot workload. Since observed inflation seemed to be very positive, it was judged that the canopy porosity could be safely increased to make the chute more stable.

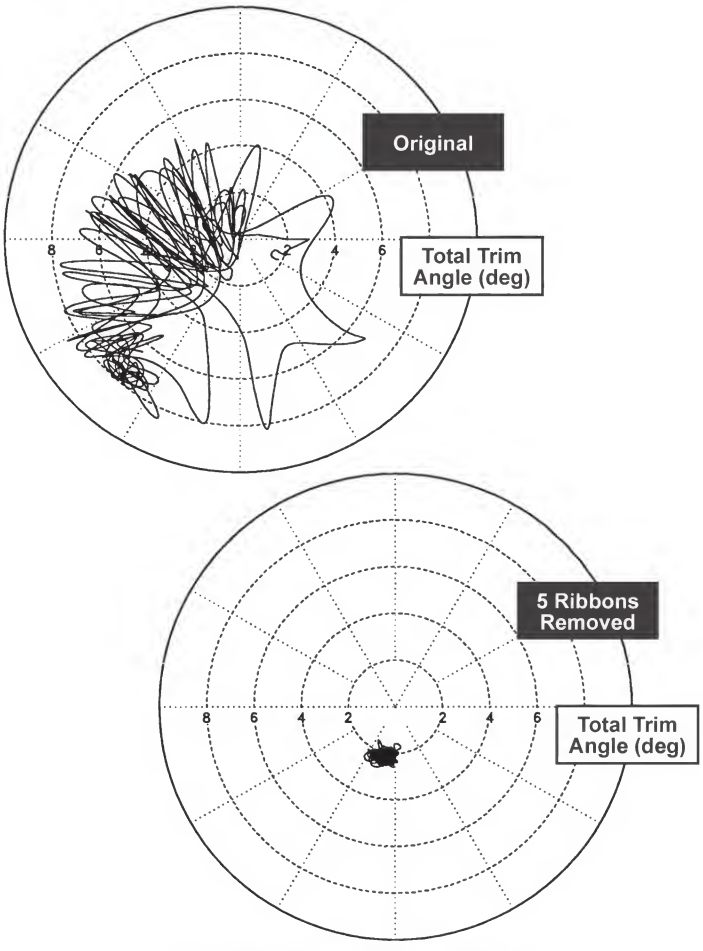
So we took some parachutes to the very large 80 by 120 ft wind tunnel at Ames and experimented with various schemes to increase the stability of the canopy. The most effective means was found to be increasing canopy porosity by simply incrementally cutting ribbons out of the canopy at key locations and measuring canopy oscillation. A small, lightweight sensor was



placed in the center vent area to indicate by means of tracking photography the canopy excursions (angular oscillations) at the various porosities tested (see below). The bottom line was that by removing 5 of the 97 concentric ribbons, stability was excellent in the tunnel and loss of drag was minimal. This change was incorporated and all subsequent Orbiter landings have been free of the stability issue.

The only other notable issue was on John Glenn's STS-95 flight in 1998, when the parachute compartment door inadvertently jettisoned at launch. As the main engines were coming up to full thrust, the door was seen to come off and get caught up in the main engine plume which carried it down the flame bucket. So we had an Orbiter in flight without a door. This became an extremely uneasy situation because no one knew the condition of the now-exposed main pack retaining ties, or the temperature of the mortar pyro cartridge, and it suggested the chute might deploy at any time during the flight. It did not deploy however, but remained in its compartment through orbital insertion and the entire mission.

But in true manned spacecraft fashion, many groundlings spent the next several days (and nights) thinking up all the horrible things that could happen if the chute deployed prematurely-and of course, what to do about it. Like what if it deployed in space, flailed around, and became wrapped around the vertical tail so that the rudder and speedbrakes couldn't function. In such a case, would the chute burn away during entry, or hang around and cause problems? Or how about this one-what if it deployed just as the Orbiter was about 40 ft altitude during landing approach causing the Orbiter to touch down short of



Oscillation Path of Chute Vent



the runway, or at least endangering an already-difficult landing sequence? Fortunately none of these things happened and landing was normal, but the chute was intentionally not deployed to avoid introducing uncertainties. Post-flight inspection showed signs of enough heat to melt some non-structural Nylon on the face of the pack, but otherwise the chute and compartment were in good shape. A specific cause for the anomaly was never determined, but tolerances and controls were tightened up and no further problems have occurred.

People ask if we reuse the chutes. Yes, we do—up to 15 uses of the textile parts and 10 uses of the metal parts, such as the mortar. We started out with a reusable main chute but it was heavy with all the extra beef designed into it. So we made it a single use chute and knocked 40 lbs out of the design. Later we saw that the chutes still looked new after a single use and the cost of replacement chutes had gone up significantly. So we ran a lot of tests on materials and determined we could safely reuse the hardware with adequate controls. Interesting thing is, we added back less than 1 lb—this to cover areas of possible abrasion. And this slight-of-hand saved us about 39 lbs! To date, we have used main chutes up to 7 times and saved a ton of money.

The drag chute has now been used approximately 75 times with satisfactory results. The astronauts love it because it gives an added margin of safety in the difficult process of landing that solid brick. It has also saved untold dollars on brake and tire wear.

We've never had a landing emergency where the drag chute was called upon to save the day, but that big red, white, and blue canopy adds color, drama, and action to the scene every time the big bird comes home. And, of course, we keep on banking the dollars saved on those brakes and tires. So here's to John Young. Too bad he never got to fly it.

About the author: Chuck joined NAA Columbus Division in 1957 while obtaining an M.S. in Mechanical Engineering at the University of Kentucky. Having worked there on ejection seats and missile recovery, he transferred to the Space Division in 1962 as Engineering Supervisor for the Apollo Earth Landing System. He later became Engineering Manager of Docking, Ordnance, and other Apollo Systems. In 1975 he Became Engineering Manager of Shuttle Mechanical Systems. Later he was Chief Program Engineer of the Teal Ruby Program in Seal Beach. Chuck retired in 1987 and has consulted on several programs, including the Space Shuttle Drag Parachute. He lives in Garden Grove, California.

Quarter-Scale Space Shuttle Model

Stan Barauskas

At the outset of the Space Shuttle Program, a Ground Vibration Test of the individual and mated Shuttle elements was included in the overall test and verification planning. The production schedules and availability of the flight Shuttle elements made it desirable to consider sub-scale rather than full-scale vibration testing. The Saturn V one-tenth scale model, for example, was successfully used to provide some satisfactory vibration data but at one-tenth scale it was necessary to simulate some upper stage structure and joints and did not provide the same degree of correlation with theory as desired. There was some consideration given to a one-eighth scale and a one-fifth scale Shuttle model but each had its limitations. The final size selection of a quarter-scale Shuttle model was large enough to permit near replication of all primary structure and joints while meeting the size limitations of the available test facilities. The design and fabrication of the test article was initiated in mid-1974; the testing began in late 1976 and was concluded in December 1977.

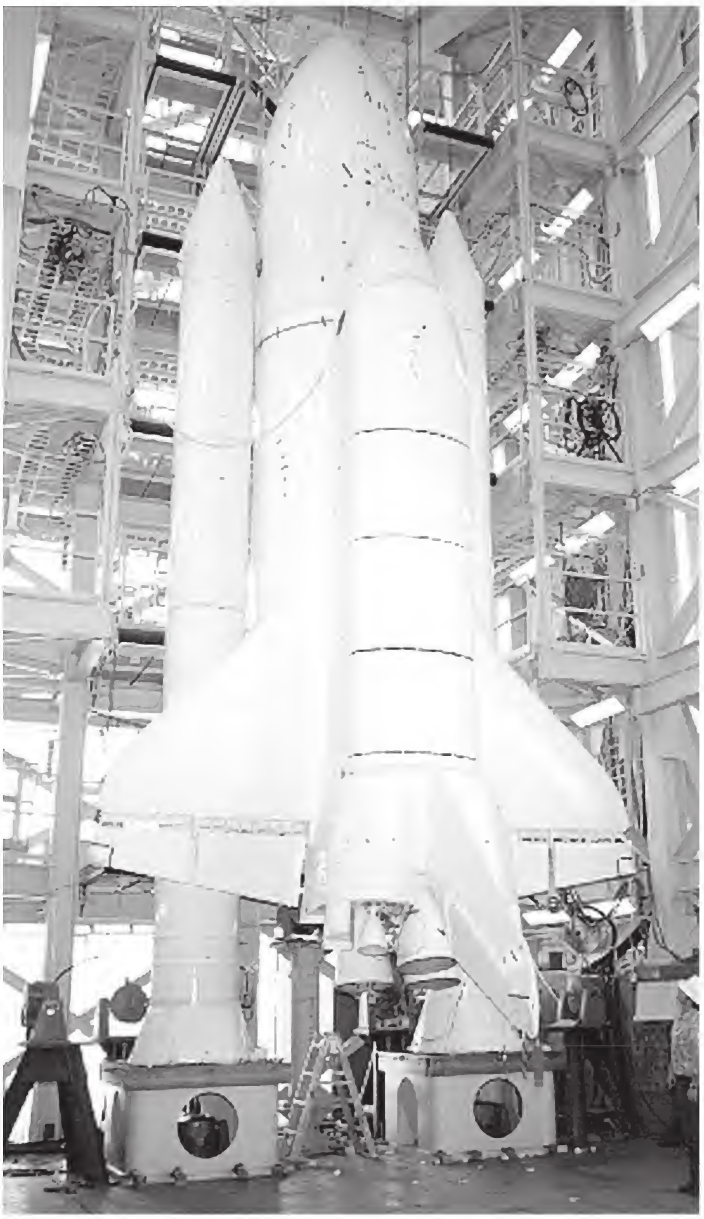
The vibration test program concentrated on the dynamic environment of the mated Shuttle configuration associated with the initial phases of the Shuttle mission profile from lift-off through main engine cut-off. The vibration testing included verification of the dynamic math model of the individual single elements: the External Tank, Solid Rocket Boosters (SRBs) and the Orbiter and the four different Shuttle system assembly configurations:

1.0 Heaviest assembly (included a 500 lb payload in the Orbiter Payload Bay to simulate the maximum 32,000 lb actual payload)
2.0 A lesser weight assembly simulating conditions at a critical boost phase flight time
3.0 Least weight assembly at the end of boost phase
4.0 External Tank tilted at 13 degrees to simulate post SRB separation

Three pairs of SRBs were created to simulate three different configurations: one pair was completely filled simulating lift-off, a second set simulated the propellant level at max Q and a third set simulated the SRB empty condition at burn-out. The External Tank Oxidizer was simulated using deionized water with the level adjusted according to the mission phase being simulated. The liquid hydrogen fuel quantity was considered small enough to be omitted from the model for test purposes. In order for the model to be representative, full replication (exact scaling to the 1/4 of actual dimensions) and near replication, which allowed for some minor simplifications for cost savings, were implemented. Near replication was permitted where the overall elastic stiffness characteristics would not be compromised. Careful attention was given to joint design and the use of alternate materials that were selected for their stiffness similarity and ease of fabrication. The design, fabrication and assembly was accomplished by the Los Angeles Division Model Shop with approximately 90% of the machined detail parts and subassemblies subcontracted to various aerospace manufacturers. Once completed, the entire assembly measured 46 feet from the bottom of the SRB boosters to the tip of the External Tank and 19.5 feet wide Orbiter wing-tip to wing-tip. The weight of the entire assembly simulating the lift-off configuration was 62,853 lbs.

The test fixture was assembled in the Bldg 288 High-Bay in Downey and consisted of an open, rectangular, bolted steel framework 56 feet high, 30 feet wide and 26 feet deep anchored to the facility floor concrete slab. Ten vibration tests were performed in the facility simulating various Shuttle Element and Assembly configurations and ascent flight phases.

The quarter-scale Shuttle dynamic test program met its objectives of providing verification of predicted dynamic response characteristics early in the Shuttle effort. The data obtained from the dynamic tests had verified the math modeling techniques for predicting modes and frequencies of various Shuttle configurations. The program confirmed the benefits of the use of dynamic scale models to verify math models and assist in the analysis of vibration environments of future space flight launch vehicles.



The complete Quarter-Scale Shuttle Test Article was installed in the vibration test fixture located in the Downey Bldg. 288 High Bay.

Ultimately, the quarter-scale vibration test data was enhanced by additional vibration testing performed during the Full Scale Mated Vehicle Ground Vibration Test Program conducted at the Marshall Space Flight Center beginning in late 1978 and ending in March 1979. For these tests, the Shuttle Orbiter Enterprise, having completed its Approach and Landing Test Program at Dryden Flight Research Center, was ferried to MSFC on March 13, 1978 and mated to an External Tank and Solid Rocket Boosters. The objective for these tests was to evaluate the mated configurations' critical structural dynamic response modes which were then assessed against analytical math models used to design the various element interfaces.

Subsequent to the completion of all testing required to support the Space Shuttle Program, the Shuttle Quarter-Scale Assembly was retired as a test article and downgraded to its status as a museum display artifact. The External Tank and all three of the SRB configurations were shipped to NASA JSC and are currently stored there. The Orbiter element was provided to Canada's SpacePort Museum in Calgary for display on a 10-year loan basis which expires in 2010 and is currently suspended from the ceiling of the Calgary International Airport (see photo). The National Air and Space Museum of the Smithsonian Institution intends to have the External Tank and SRB elements eventually transferred from JSC to its facility in Washington, D.C. They are destined for possible future display as a complete Shuttle Assembly once the loan period of the Orbiter for the SpacePort Museum expires. There is a possibility that Downey might be the eventual home for this incredible model if certain conditions are met. Dr. Neal, Space History Curator at the National Air and Space Museum, stated "...please be assured that future display of the model at Downey may be possible when (a) the artifact is transferred to NASM custody and (b) you have a museum-like facility open to the public. As the original home of the orbiters, Downey is certainly an appropriate location for Shuttle artifacts."

In the meantime, the SpacePort Museum is also considering the possibility of requesting an extension of its loan for the Orbiter element.

The Quarter-Scale Model was an incredible engineering feat and its temporary stay in Downey during dynamic testing certainly adds to the rich history of major space achievements that this site has witnessed over many decades.

Acknowledgements:

1.0 Technical information was obtained from a paper written by D.H. Emero, Project Manager, Shuttle System Project Engineering, Integration and Operations Division. The paper *"Quarter-Scale Space Shuttle Design, Fabrication, and Test"*, was published in the Journal of Spacecraft and Rockets, 1980, 0022-4650 vol. 17, no. 4 (303-310)

2.0 NASA-JSC and Museum information were provided by the following:

2.1 Julie Kramer-White, NASA Chief Engineer, Crew Exploration Vehicle Project

2.2 Dr. Valerie Neal, Space History Curator at the National Air and Space Museum of the Smithsonian Institution in Washington, D.C.

2.3 Kim Sinclair, Commercial Properties Coordinator, Calgary Airport Authority

About the Author: Stan joined NAA in 1963 as a Propulsion Systems Engineer on Apollo working on the SM RCS Rocket Engine Program. After Apollo, he continued that assignment on the Skylab SM RCS and later did the same work for the Apollo-Soyuz Test Project. He started working in the Propulsion and Power Systems group on the Space Shuttle Orbiter Program in 1973 and continues in that task today. Stan resides in Diamond Bar, California with his charming wife Elke.



The Quarter-Scale Shuttle Orbiter, suspended from the ceiling at the Calgary International Airport, is scheduled for return to the United States in 2010

Mustang – The True Birthright

by Lowell F. Ford

Editor's Note: We asked Lowell to comment on the superb article by Christopher Shores about the original P-51s sent to Britain during World War II. His commentary regarding how the Mustang came about resulted in this splendid article on the origins of that famous airplane. All photos are from the author's collection.

The Mustang airplane was a wonderful addition to the military inventory of World War II. According to Hap Arnold, it appeared just in the nick of time to allow the air war against the Axis powers to continue. Writings about its origin have been carbon copied from books to articles and few have come close to portraying the actual birthright of the legendary escort fighter which owes much of its conception to Dr. Clark B. Millikan of the Guggenheim Aeronautical Laboratory, California Institute of Technology based in Pasadena, California.

As 1937 drew to a close, James H. Kindelberger, better known as "Dutch", reflected back on the success of North American Aviation, Inc. since the move to the West Coast from Dundalk, Maryland, in 1935. A relatively new competitor in the aviation industry, NAA was fortunate to meet with good success in capturing new business and forging new relationships within the military establishment. One of these key figures was General Hap Arnold. Hap made a point of maintaining close association with the manufacturing industry that supported the Army Air Corps and drew on the talents of their organizations to provide technical advice outside the Material Command at Wright Field.

Other contacts, from the 1936 Air Races at Mines Field (now Los Angeles International Airport), would prove invaluable over the next several years. Ernst Udet, who performed his famous act of picking a scarf up from the runway with a wing tip, had toured the NAA facility and had extended an invitation to Kindelberger to visit him in Germany should he ever travel to Europe. The French Test Pilot, Michael Detroyat, who piloted the Caudron racer to victory at the race and housed his sleek craft in the NAA plant, would be a return visitor as part of the French delegation assessing America's aircraft production facilities. He would interact with Ed Horkey on a subsequent visit, providing information on quantitative testing of airplanes.

Though a pursuit project had been on Dutch Kindelberger's mind, he had reservations about entering that field of competition. Curtiss Wright was well entrenched as a major supplier of pursuit type aircraft for both the Army and the Navy. This prevailing reputation made competition on the home front a very risky proposition. An export pursuit airplane seemed to be a more lucrative undertaking, but the design would be limited by export controls, especially if the performance of the export product met or exceeded the performance of existing aircraft in the U.S. arsenal. Not only was the export of the airframe tightly controlled, but the power plant would have to be approved separately.

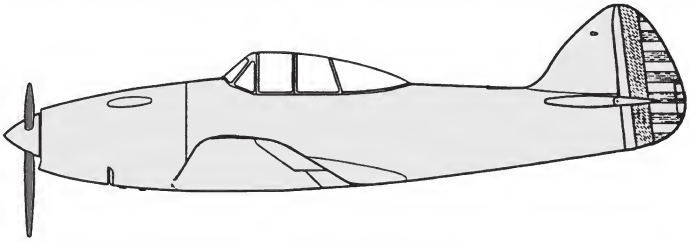
Ernie Breech, of the General Motors Board of Directors, had urged Kindelberger to enter the pursuit competition field several times since the company had become a manufacturing corporation on January 1, 1935. This suggestion was pursued in earnest that year as NAA entered the two place pursuit competition with an airplane designed around an Allison V-1710 engine, an engine which would not be test flown for another year. This proposal has been addressed in a previous issue of NAAR News as the P-198 design or XP two-place fighter designed by Lee Atwood. This design went into storage with the cancellation of the Air Corps requirement for a two-place pursuit.



Clark Millikan at work in the Caltech 10' Wind Tunnel

Following in the footsteps of the P-198 design, a study for an export pursuit was launched on February 3, 1938, as scratch notes were prepared for the modification of trainer aircraft parts and assemblies into a single place pursuit for export. With this effort, the groundwork was laid for the development of the NA-50, NA-50A, and NA-53 "Super P-64" export pursuit later that year. At this time, the British Spitfire had already flown and had been introduced in a public viewing.

Hap Arnold had received reports from individuals traveling in Europe, such as Eddie Rickenbacker, regarding the buildup and advancements of air power in Germany and was well aware of the implications. A request was initiated, in February 1938, by his office for a comparison study between American and foreign aircraft. However, in addition to this request, he tasked North American Aviation, Inc. to provide a study that would



Lee Atwood's 1935 two-place pursuit design built around the Allison V-1710 engine

best depict the next generation pursuit airplane. Support for this later request would be difficult for NAA to muster due to the heavy workload on hand. Kindelberger explained this to Hap Arnold in his letter of March 29, 1938:

> *"In order to do the job properly, finding that our gang was pretty well tied up on other work and that I did not have just the person to do the job the way I wanted it done, I have hired Dr. Clark Millikan of California Institute of Technology to do some work for me on this subject."*

In this same letter he responded to the request for a comparison of U.S. and foreign aircraft, which indicated that the Curtiss Hawk P-37 would be comparable to the Spitfire.

The completion date on Dr. Millikan's report, *"The Performance Estimate For Idealized 1938 Pursuit Airplane"*, was March 29, 1938, the same date of Kindelberger's letter to Hap Arnold. This document was then flowed down to key individuals in the NAA organization, specifically, to Lee Atwood, Chief Engineer Ray Rice and Edgar Schmued, the latter being head of the Preliminary Design Department. The Millikan Report, as it had come to be known, was prepared based on the limited amount of information given him.

On April 15, 1938, Kindelberger sent a letter of transmittal to Hap Arnold, which included a copy of the Millikan Report, and expanded on his comparison of U.S. and foreign aircraft. He also explained:

> *"I was very fortunate last week in having the opportunity to discuss the Messerschmitt with a top-notch German engineer, who happens to be the brother-in-law of Messerschmitt…".*

This German engineer was Prof. Dr.-Eng. George Madelung, who was married to Willy Messerschmitt's sister Ello. Kindelberger then went on to explain the information he had passed on to Dr. Millikan in order for him to prepare the accompanying report:

> *"The specifications were: landing speed = 70 mph, power = 1,150 hp at 16,500 ft (this was to duplicate the power and altitude of the engine in the Supermarine* "Spitfire"*), the ship to be as small as possible, cleaner than possible, and to have no external armament or radio, and to weigh 6,000 lbs."*

The fuselage overall width of 40 inches and overall height of 60 inches referenced in the report are not mentioned in his letter. Based on Kindelberger's instructions, Dr. Millikan's report described in optimistic aerodynamic terms, an airplane capable of traveling at 391 mph, or reduced to 377 mph for the most optimistic type of service plane. The most comparable engine in America to that of the Spitfire was the 1,000-hp Allison.

In his report, Dr. Millikan made mention of another system feature that is not mentioned in Kindelberger's letter, the cooling system drag. Dr. Millikan stated that the calculated cooling drag:

> *"...could be reduced perhaps by 50% if the radiators were placed entirely inside the wing or fuselage and a carefully designed ducting system used to lead the air to and away from them. However, no such installations have as yet been reported, and they would be especially difficult to work out in such a small airplane."*

All indications are that Dr. Millikan was working solely from Kindelberger's brief specifications to produce the report that he had commissioned. Oliver Echols of Material Command was sent a copy of the Millikan report simultaneously with the copy to Hap Arnold. Other key personnel in the Army Air Corps Material Command including Lt. Ben Kelsey, head of fighter procurement, would not be sent a copy of the Millikan Report from NAA until after Kindelberger departed for Europe in late May 1938, as mentioned in his April 15th letter to Hap Arnold. The responsibility for this flow down would rest with Lee Atwood, Kindelberger's second in command.

In the background of this and other ongoing work, the Allison Engine Division of General Motors had been continually updating NAA, a sister company in the GM stable, with progress reports and technical changes on their V-1710 engine, which at that point, was the engine of choice for the Idealized 1938 Pursuit. The data from Allison was distributed to Chief Engineer Ray Rice, Chief Designer Edgar Schmued, Power Plant Chief John Young and C. T. Torresen of the Standards Department.

On May 6, 1938, the Army Air Corps Material Command issued E.S.M.R. Serial Number P-51-643, a request for comments on an airplane, whose specifications were given in detail, designed around an Allison V-1710 engine with a built in supercharger, as depicted on Material Command drawing Number P38M960. *(Authors note: This drawing has not been found in any of the national repositories.)* Far too detailed to include here, the design data contained in this E.S.M.R. closely resembled a product derived from the Millikan Report, right down to the extremely clean exterior, the cooling system housed within the fuselage and the 10-foot, 3-inch diameter 3-bladed automatic pitch constant speed propeller. The gross weight was listed at 5,385 pounds, the design altitude as 15,000 feet, high speed at design altitude was 358 mph, wingspan is 32 ft, 6 in. and the overall length is 24 ft, 9-1/2 in. The length was revised to 26 ft, 10-1/2 in. in a penciled note by NAA. Analysis of this report would fall to Edgar Schmued in Preliminary Design where a study had begun in secret on an Allison powered pursuit.

With the increase in workload, and not having an Aerodynamics Department as such, Kindelberger realized this placed a heavy burden on the other members of Engineering to fill this gap. He approached Dr. Clark Millikan at Caltech to recommend a potential soon-to-graduate student to fill the job. The student selected was Ed Horkey, who had been working his way through college in NAA's transportation department. Horkey was hired upon receipt of his diploma in June 1938 and given a desk in the Preliminary Design office with Edgar Schmued. Horkey's contributions as an aerodynamicist would prove him to be a valuable asset on many NAA projects.

With his commitment to Hap Arnold behind him, Kindelberger and a representative from Export Sales set off on their scheduled trip, leaving the factory business in the hands of Lee Atwood. After the landfall in England, they were toured throughout the British aircraft industry, which included the production facilities for the Supermarine Spitfire. Kindelberger noted that multiple wing assembly lines were required to support one fuselage assembly line, largely due to the complicated elliptical wing structure used on the Spitfire. Following the British tours and formalities, Kindelberger departed England for Germany, leaving the Export Sales representative behind to finalize a contract for the Harvard trainer aircraft.

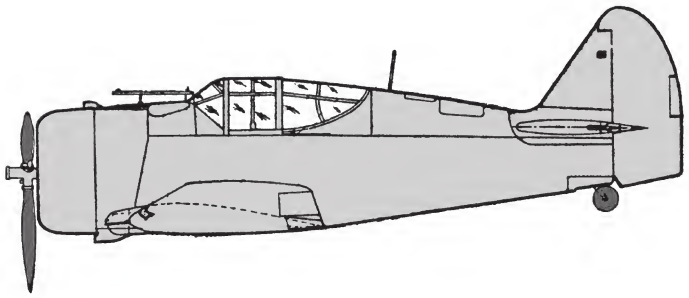
Once in Germany, Kindelberger became the personal guest of Ernst Udet, on an invitation which Udet extended to him at the 1936 air races in Los Angeles. Udet, who that same year had been placed in command of the Reich Air Ministry's development section, gave his guest from America the "cook's tour" of the German aircraft industry. Commenting on the efficiency of the assembly lines, Kindelberger was told by Udet that this had been learned from America. Another American would soon follow in Kindelberger's footsteps through the German factories. Charles Lindbergh was touring Europe on a factfinding mission for Hap Arnold. He would enter Germany through Belgium shortly after Kindelberger returned to England.

While Kindelberger had been in Germany, the British had decided to place a sizeable order for Harvard trainers and the legal documents awaited his signature when he returned to England. The British had, a short time before, announced that they were going to expand their air programs, but their production capabilities were limited. Following his return to Britain, Kindelberger was approached about building Spitfires to supplement British production. This, he declined based on the complicated wing design and the existing workload already in the NAA factory. In subsequent conversation, he was made aware that a next generation fighter was being planned as a replacement for the Spitfire and that the Operational Requirement, OR.73, would soon be issued. The requirement OR.73 called for an airplane whose data was fairly well in line with the data contained in the Millikan Report. The Martin Baker MB.3 designed to this requirement would not fly until March 3, 1942. Prior to his departure from England, the British suggested to Kindelberger that NAA design and build a new fighter of its own.

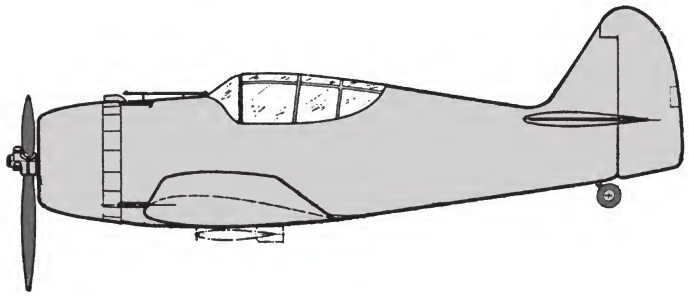
While Kindelberger and Brophy were away, Allison Engine Division had provided the latest updates on their V-1710-F1 and F2 engines to NAA's Chief Engineer, Ray Rice, including a note that a change order was going through to permit the use of liquid-cooled engines in place of air-cooled as equivalent engines. Heretofore, liquid-cooled engines were not allowed for use in pursuit aircraft, and this predicted change would allow airframe designs with greatly reduced frontal area. Along with this development, the pursuit that had been developed out of trainer parts went into production on August 1, 1938 as General Order NA-50, on a contract with Peru.

As Kindelberger and Brophy were returning home from England; a more powerful version of the NA-50, utilizing the R-1830-S3C-G engine, was started. The NA-50A (NA-53 Super P-64), was a re-engined NA-50, whose characteristics made it highly competitive with the Curtiss Hawk. Under the current export controls this would make the NA-53 ineligible for export. Another NA-50A variant would become the NA-68, built under contract for Siam and, after confiscation by the U.S. Army Air Corps, would be known as the P-64.

In Germany, the Munich Conference, held on September 29, 1938, had ended with Hitler gaining concessions which would increase political tension across Europe as his buildup for conquest continued. Kindelberger and Brophy would return to NAA to find multiple pursuit projects in work, the NA-50, NA-50A and the NA-53, along with the secret Allison powered pursuit study making slow headway in the background. The information they brought from Europe



Profile of the NA-50 fighter built for Peru from converted trainer components



Profile of the NA-53 Super P-64 intended as an export fighter

drove a thorough review of all pursuit business on hand. Work was proceeding on the NA-50 contract for Peru. At least nine versions under the NA-50A General Order developed from trainer airframes were studied in the 1937-1938 period.

On January 5, 1939, the British formally issued high-speed single-seat fighter specification F.18/39, Operational Requirement OR.73, as a replacement for their Hurricane and Spitfire fighters. The NA-53 project was cancelled by an order from Lee Atwood on February 3, 1939, the engine on loan for this project was shipped to the Douglas plant for use there and all NA-50 common parts were returned to stock. At approximately this same time, Atwood had become aware of a report out of Britain, RAE 1683, dated August 1935, regarding the cowling and cooling of radiators in such a manner as to actually nullify much of the radiator drag and possibly produce thrust from the exhausted air. This minimum pressure drop effect would come to be coined "The Meredith Effect" after the author of the theory.

The Meredith report was later improved upon by R. S. Capon of the R.A.E. as RM 1702 and published in March 1936. An improved study by Gothert on the subject was published in Germany. This document, dated September 10, 1938, was subsequently adopted and published by NACA as TM 896. This later report, NACA TM 896, would be the one Ed Horkey, in conjunction with Irving Ashkenas and Joe Beerer, used to develop the cooling system for the Mustang airplane.

In its eyes, the Army Air Corps considered NAA as an excellent provider of trainer, observation and medium bomber aircraft. Therefore, when they issued Circular Proposal CP39-770 for the 1939 pursuit proposal competition on March 11, 1939, North American was not asked to submit a design for competition. Instead, NAA was asked to comment on the circular proposal.

CP39-770 offered two liquid-cooled power plants as alternatives to the usual radial engines seen in previous circular

proposals. One was the Pratt & Whitney X-1800 flat engine, the other was the Allison V-1710 of 1,150 hp. Edgar Schmued commented back regarding a Material Command design incorporating each of these two engines. His main criticism was directed at the fuel load, which was felt to be too restricted, based on the calculated performance of the airplane. He suggested adding external fuel tanks, which was contrary to operational policy, to increase the operational range instead of carrying the fuel internally. He also recommended changes in armament locations, from the engine compartment to the wings outside the propeller arc. Another important factor was the cooling system, on which he commented:

"Due to the small size of the engine compartment, the oil radiator, coolant tank and cooling radiator will have to be placed in the fuselage to the rear of the pilot."

These comments were submitted to the Chief Engineer, Raymond Rice, for review and transmittal to the Army Air Corps shortly after May 17, 1939. That ended NAA's involvement in the Army Air Corps pursuit competition for 1939.

By June 1939, Edgar Schmued had made good progress on the preliminary design for the Allison powered pursuit which resulted from the Millikan Report. Two members of the British Air Commission, H. C. B. Thomas and Charles Luttman, visited NAA and received a progress review on the Allison powered pursuit, or rather, the Company Sponsored Pursuit.

It was shortly after this visit that NAA launched a secondary effort to produce the NA-53 as an export fighter to support the French and British needs following the fall of Poland. Work on this project was engaged with issuance of Specification 1405-A on October 27, 1939. This proposal went through several iterations presenting the NA-53 with six different engines and terminating as Specification 1533 on December 8, 1939. The death knell had been sounded for the NA-53.

On this same day, the finishing touches had been completed on a tentative specification for the Allison-powered Company Sponsored Pursuit which was issued to compliment the design drawing package that Ed Schmued had been preparing. This design would be known later as P-509 or, the NA-50B.

In the wake of the NA-53 project retirement, a decision was made to respond to comments indicating that France and Britain were leaning towards a lightweight fighter. This information evolved into Edgar Schmued's design P-500 which became known as Shop Charge SC-46. Funding for the SC-46 program had been approved by the GM Board of Directors in response to a request from Kindelberger with the support of board members Breech and DuPont.

A first thought of reviving the NA-53, since its production was cancelled earlier in the year, was short lived in favor of proceeding with the Ranger powered SC-46 as a stopgap fighter with potential sales as a fighter-trainer for export. This seemed more plausible as the Allison powered pursuit, P-509, moved forward in a cloak of secrecy. The General Order for the SC-46 was issued on December 18, 1939. In order to support production of the SC-46 with limited delays, the Ranger Engine Company had been approached by NAA to open a plant two miles to the north of the NAA location at Mines Field. With one strike against them with the failure of the French or British to consider the NA-53 design beneficial, Edgar Schmued's rough proposal drawings for the SC-46 design were handed over to Al Algier, who was responsible for putting them into the correct NAA format.

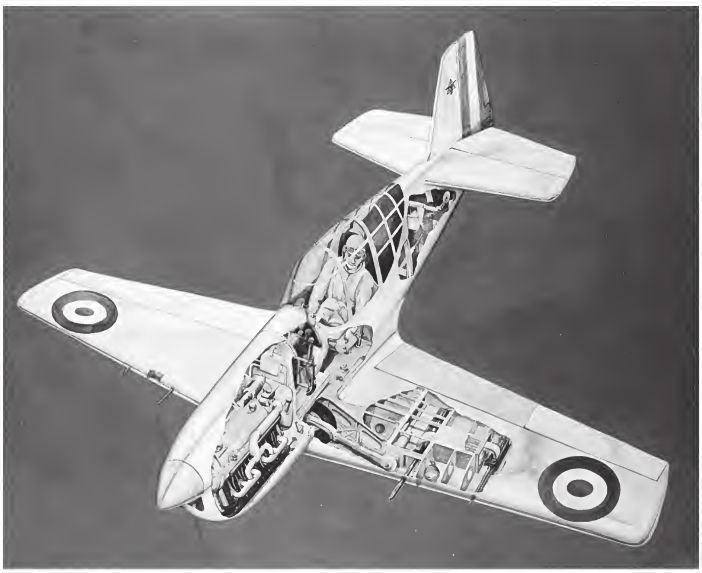
Herein lay the secret as to why so few of Edgar Schmued's drawings survived carrying his name. Al Algier would erase Ed Schmued's information in the lower right corner of the drawing and add the proper format title block and border, bring the line weights up to standard and then sign off the drawing as the preparer in the "Drawn By" block.

By January 23, 1940, the P-500 Light Weight Fighter Design was ready for presentation to the British and the French. Kindelberger and Atwood traveled to New York and met with representatives of the British Air Ministry, with the purpose of selling them on the P-500 design. The presentation was a dismal failure and ended with the British insisting that NAA build the P-40 under license from Curtiss. Atwood, quite familiar with the P-509 design that was fermenting back at the plant, requested another meeting on February 6th in which he sketched out the general arrangement of the P-509 Allison engine pursuit. However, without a proper proposal, the effort was futile and the British pressed forward with their demand that NAA build the P-40. At this point, Kindelberger returned to the factory in California, leaving Atwood to continue working with the British on a favorable solution to the problem.

NAA's Aerodynamicist, Ed Horkey summed up the situation:

"We had a meeting in the War Room on the second floor of the Admin Building. Here we reviewed the pursuit design and formulated a plan to move the proposal ahead without delay."

The P-509 design was revised by Ed Schmued, relocating the radiator duct forward of its original position. The drawings were then turned over to Al Algier for final formatting. On March 5, 1940, Kindelberger notified Ernie Breech that "the big foreign deal has blown up and he is rushing to New York to keep in touch with the situation". On March 6th, a counter proposal was sent to the British stating that NAA would build a plane of its own design that would be better than the P-40. On March 11, 1940, the P-509 proposal package, consisting of three drawings and the preliminary design data Specifica-



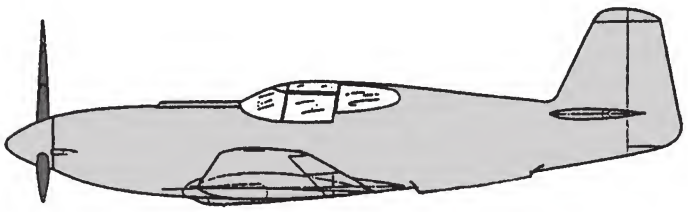
Edgar Schmued's P-500, SC-46 light weight fighter design proposed to the Anglo-French Commission

tion 1592 were airmailed to NAA's New York Headquarters at Essex House. Ed Horkey's aerodynamics report, *"The High Speed of the Allison Powered Pursuit"*, which completed the proposal, would follow on March 18th.

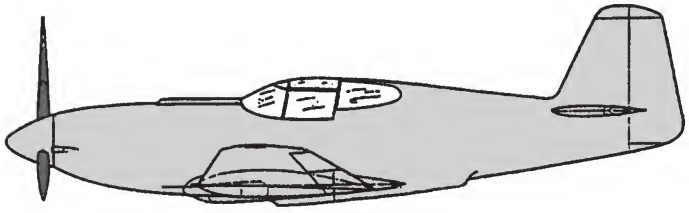
By March 15th, positive progress had been made and confidence was high enough for Research and Development Order SC-1050 to be issued for studies to proceed on the Allison engine pursuit design and for the construction of a mockup. Lee was still hard at work reassuring the British that the P-509 design would be a sure winner and incorporate the British cooling system technology theorized by Meredith. Meanwhile, Ed Horkey of NAA's Aerodynamics Department had initiated wind tunnel tests of a wing section with armament in support of the impending pursuit project.

At the insistence of Sir Henry Self, NAA was instructed to procure data from Curtiss Wright to support the production of NAA's fighter project and to support the production of P-40 airplanes should NAA's design fail. On April 10, 1940, the day that Hitler launched his invasion of Denmark and Norway, Lee Atwood traveled to the Curtiss Wright facilities in Buffalo, New York to negotiate with Burdett Wright for documentation on the P-40. The meeting was set for April 11th. At this point, Burdett Wright became fully aware that NAA's proposed design had become a competitor with the XP-46. The XP-46 had been proposed as the replacement for the P-40 and plans were afloat to make the plane available for foreign sale. Burdett Wright agreed to provide data to NAA at a price that would partially compensate his company for the development of the XP-46. The sum agreed upon as a result of this meeting was $56,000.00. An attempt was made by Wright to recover the remainder of the XP-46 development costs from the Army Air Corps, which met with failure based on the design being declared a corporate venture by the Army Air Corps.

This business out of the way, Atwood returned to New York where he received a letter contract for 400 NA-50B pursuits to NAA Spec 1592. Burdett Wright prepared a list of documents on April 17, "Various items of data which might be considered of interest or value to North American". Included

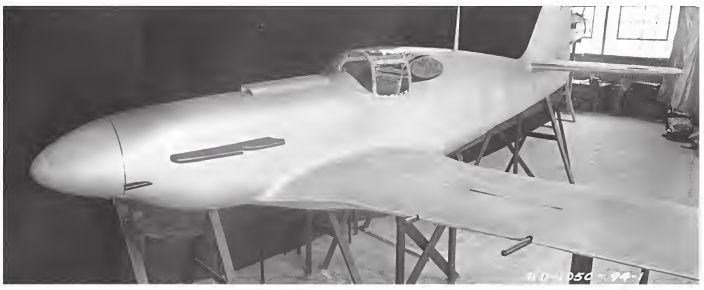


Dwg. No. P-509, circa February 1940



Dwg. No. P-509-1, March 10,1940

Edgar Schmued's P-509 design, the NA-50B Allison-powered pursuit proposal accepted by the British



The SC-1050 Mockup of the NA-50B or P-509 design accepted by the British

with this list was a page entitled "For discussion of development costs to be met, in part, by North American in building a new pursuit for the Anglo-French". However, the document package of items selected from the list would not arrive at NAA until May 14, 1940, well after the baseline design for the NA-73 airplane had been established. An attempt by Curtiss to extract royalties from NAA was foiled, since the NA-73 airplane, soon to become known as the *"Mustang"* was unique to North American Aviation, Inc.

On April 14, 1940, Lee Atwood issued General Order NA-73 for the construction of one Allison powered single engine pursuit airplane, including all charges accumulated on General Order SC-1050 to be transferred to this order.

There was one more hurdle for the new pursuit to clear. The export license agreement with the Army Air Corps had been submitted but not approved. It was being withheld pending a report on the legalities of exporting an advanced fighter to belligerent nations, strictly forbidden previously by presidential order. When Hap Arnold was made aware of the situation, he stated that it was, "Probably just another of Dutch's South American trainers". On April 25, 1940, all such restrictions were lifted, paving the way for unlimited sale of the latest models of American warplanes to France and Great Britain.

After the introduction of the Packard-built Rolls-Royce Merlin engine, the Mustang became a truly magnificent performer – escorting bombers on long-range missions in both the European and Pacific Theaters. Edgar Schmued's second-degree curve method of design provided an exceptionally clean, flush riveted fuselage that housed Lee Atwood's much pampered minimum pressure drop cooling system. Ed Horkey's laminar flow wing limited the effects of compressibility and saved many pilots from certain disaster in combat. Ralph Ruud's highly efficient production line enabled an exceptionally high production rate. Above all this was James H. "Dutch" Kindelberger whose management skills solidified efforts to produce one of the greatest fighter aircraft of World War II.

About the Author: Lowell hails from Ocean Springs, Mississippi, just a few miles east of Keesler AFB which accounted for many AT-6 and B-25 flights over his home. He developed an early interest in aviation and began flying forward swept wing model gliders in 1949 while still in grade school. He moved to California in 1962 and joined NAA as a Blue Print Folder and Trimmer. Except for a four-year stint in the military, he continued working until he retired from Boeing North American in 2003. An avid P-51 historian, he currently resides in Torrance, California with his charming wife, Linda.

North American Aviation Awards at the U.S. Air Force Academy

by Edmund Rusinek

After a series of very amicable exchanges with the NAA Retirees Bulletin, the United States Air Force Academy has agreed to create three departmental awards in the name of North American Aviation to be awarded each year, starting in 2010, in perpetuity. These awards will be presented to the outstanding graduating cadets in the fields of aeronautics and astronautics. Usually presented in the name of outstanding individuals, having these named after our company will memorialize the name North American Aviation long after we are all gone! Each department at the academy chose its own title for the award, so each is different; however, the intent is the same:

- ***NAA Award for Excellence in Applied Aeronautics Research***
- ***NAA Award for Outstanding Cadet in Aerodynamics***
- ***NAA Award for Outstanding Achievement in Selected Astronautic Courses***

In addition, the NAA Retirees Bulletin will sponsor the Outstanding Cadet Candidate Award at the Academy Prep School. This award will recognize the Prep School student who has demonstrated excellence in all phases of the Prep School Program. The student must:

- Possess a superior scholastic record as evidence by GPA and test scores
- Be outstanding in all phases of the Military Training Program
- Be outstanding in all phases of the Athletic Program
- Be outstanding in all phases of the Character Development Program
- Exemplify a highly positive character, personality and potential for success at the Academy and in the USAF

As requested, this award will be named in honor of North American Aviation Inc. The NAA Retirees Bulletin volunteer staff could not think of a better organization to be associated with than an institution involving the education of young people in the fields of science who are dedicated to the military service of their country.

Many years ago, when Bill Halpin of Las Vegas, Nevada sent the Bulletin a check for $500.00, in addition to his $100.00 Silver Eagle subscription, to be used as needed; the donation was used to start a contingency fund. Over the years, other retirees sent extra dollars for "office emergencies and coffee". Since the Bulletin has no office, no hired staff and no "koffee klatches" (come to think of it, all we have are five terrific volunteers with loving care for NAA); all these monies went into the fund. This project cost thousands of dollars and we are grateful to Bill and all the others that so graciously thought of us when they sent in their renewals. Without those contributions, this sponsorship would not have been possible. It is this kind of attitude and spirit that has always made North American Aviation the Premier Company that it was!

Contrails From The Past

by Ed Rusinek

Dear Ed,

The Allison-Engined Mustang article in the Spring 2009 Issue of the Bulletin is absolutely fabulous. There are several aviation history buffs in the Nevada Wing of the Commemorative Air Force, who, I know, will be delighted in reading my copy of this extensively detailed article on the early P-51s.

—Frank Peltson, Las Vegas, NV

Ed's Ans.: Don't keep your friends waiting, Frank. Convince them to subscribe to the NAAR Bulletin and to get their own copy with the P-51 cutaway centerfold and we will even throw in the Winter 2008 Issue as an extra bonus.

Dear Ed,

Seventy years ago, in March 1939, I was hired by NAA in Inglewood to manufacture detailed parts. The starting pay was 40¢ per hour. I started on 2nd Shift so I received a 3¢ bonus and my rate came up to 43¢ per hour.

I was in Supervision for 25 years. In 1942, we organized a Foreman's Club and forty of us signed the Charter. It later became the Management Club. I am the only charter member remaining. I retired in 1981.

—Gene Hales, Stuart, OK

Ed's Ans.: Thank you, Gene, for this brief insight of the company during the early years. You folks did a splendid job of making NAA the best company with the finest people!

Congratulations and Best Wishes to

Gerald and Esther Funk
of Paonia, Colorado celebrating their
66th Wedding Anniversary

William and Betty Anderson
of Edmonds, Washington celebrating their
64th Wedding Annivesary

John and Rachel Koblosh
of Redondo Beach, California celebrating their
60th Wedding Anniversary

William and Geraldine Jones
of Menifee, California celebrating their
60th Wedding Anniversary

Irwin and Shirley Altneu
of La Mirada, California celebrating their
58th Wedding Anniversary

John and Jo Tranchina
of Mesa, Arizona celebrating their
41st Wedding Anniversary

To get the full value of a joy, you must have somebody to share it with.

—Mark Twain

47th Annual Bald Eagles Reunion

Photos by Lee French



Ed Mokslaveskas



Featured Speaker Dr. Robert van der Linden



Ed Rusinek

























The Silent Majority

by Stan Guzy



ROBERTS, JAMES O. "J.O.", 84 – passed away in Salinas, CA on September 6, 2008. He attended Yale University and graduated from the U.S.A.A.F. flying school in January 1944. He flew P-40s in the Aleutian Islands in 1944-45, continued his military flying in P-51 and P-80 aircraft and joined the 4th Fighter Group at Andrews AFB in 1948-49 where he was a member of the Aerobatic Team, the USAF Champion Gunnery Team and the Silver Sabres Aerobatic Team, in which he flew in the slot position and solo formations. He went to Korea with the 4th Fighter Group's first F-86As and shot down a MiG-15 during the first large scale jet air-to-air dogfight on December 22, 1950 (readers will recall his article, *"That Afternoon Over the Yalu"*, in the Winter 2005 Issue of the NAARB). Joining NAA in 1952 as a test pilot, he did extensive testing on the redesigned F-100A after the death of Chief Test Pilot George Welch. Other aircraft he flew were the F-86D, E, F, and H; the F-100A, C, D, and F; the F-107, and the T-39 Sabreliner. He later became the NAA Corporate Representative at NASA JSC, KSC, and Washington, D.C. He retired in 1982 with 30 years of Service. J.O. was a good friend of the Bulletin and he will be sadly missed.

ADAMS, LAWRENCE "LARRY", – passed away peacefully on March 27, 2009 from undisclosed causes. Larry worked for NAA/RI for 35 years and retired in 1987. He is survived by his brother and extended family.

CANNON, EDWARD J., 83 – died on May 16, 2009 of undisclosed causes. He was a Director of Contract Pricing at NAA/RI and was a member the Rockwell Management Club. Ed was a truly distinguished and valued Contracts/Pricing executive. He and his contemporaries lead the way on many landmark and innovative cost estimating/pricing methods considered essential to be profitable and successful in the industry. He was held in high esteem; a man of honor, integrity and warmth who left this world a better place.

CARTER, ROBERT L., 81 – passed away at his home in Fletcher, NC in November 2008. Bob was an engineering group leader at the Columbus Division Human Factors unit from 1956 to 1967. Under his direction, the automatic rocket powered ejection seat systems for dual and tandem crews were developed for the A3J and OV-10A.

CASTLE, PHILIP V., 91 – passed away on May 12, 2009 from undisclosed causes. After completing graduate work at UCLA he began a career with NAA/RI as a Systems Analyst, retiring in 1979. He was predeceased by his wife of 58 years, Lillian.

COVER, JOHN H., JR., 88 – passed away on February 7, 2009. He earned a Ph.D. in Physics from the University of Chicago and was part of the NAA team that won the Apollo project. He invented the Nonlethal Taser Weapon. He is survived by his wife Ginny.

DICKSON, DONALD L., 82 – died in Orange, CA on January 14, 2009 of cardiac arrest. Bob served in Manufacturing for 36 years until he retired from the B-1 Division in 1986.

EBY, KARL R., 77 – of Columbus, OH passed away on March 10, 2009 after a four-year battle with Alzheimer's disease. Graduating from Ohio State University, he joined NAA/Columbus as an electrical engineer and was involved in all Columbus developed aircraft and the B-1A/B. Karl was a member of the American Rocket Society, the Ohio Academy of Science and MENSA. He retired in 1989 with 33 years of service.

FROST, LOUIS E., 82 – of Laguna Hills, CA passed away on March 17, 2009 from undisclosed causes. Lou joined NAA in 1946 and became the NAA/RI Manufacturing Engineering Specialist for the aerospace industry association; disseminating technical information to all areas and divisions of the company. He was involved with many major projects expanding the manufacturing expertise of the corporation. He retired in 1978. He is survived by his wife of 67 years, Grace.

GEHRKE, RICHARD J., 85 – died on March 9, 2009 in Fullerton, CA. Dick served for many years at the Autonetics facilities. He later retired from Hughes Aircraft in 1991. He is preceded in death by his wife, Geraldine, and son, Bruce.

GOULD, LANE E., 86 – of Kelseyville, CA passed away on May 6, 2009. He served in naval aviation during World War II and continued his aviation career at Convair before joining NAA/RI. He retired at the Palmdale facility in 1985. Lane is survived by his wife, Lummie.

HANN, MILFORD R., JR., 71 – obituary indicated death occurred on April 20, 2009. He had served proudly in the Navy before he joining NAA/RI. He is survived by his loving wife, Rose.

HAUENSTEIN, CLIFFORD A., 75 – passed away at home in Moorpark, CA on December 17, 2008. Cliff started in the experimental engine unit, working on specialized start systems, at Rocketdyne in 1955. He then progressed through several leadership positions as Project Engineer on the Apollo Command Module ACS, Attitude Control System, and LM Ascent Engine and as Program Manager on the PK Stage IV, Peace Keeper, and Program Manager for IRAD, Independent Research & Development. He is survived by his wife Ruth.

HERM, LEO M., 93 – a resident of Anaheim, CA died on March 15, 2009. Leo was an electrical engineer at Space Division where he served on several programs before retiring in 1976 after 34 years of service. He is survived by his wife of 60 years, Gladys.

KAWANA, HARRY, 79 – of Gardena, CA died on September 30, 2008 after suffering several heart attacks. Harry joined the Flight Control Group at NAA/LAD after receiving an M.S.A.E. from USC. He received several awards for his work on the F-100, F-117, B-1, and the Space Shuttle. He retired in 1986 after 32 years of service. He is survived by his wife Mieko.

KEAS, WARDEN F., 84 – passed away on December 2, 2008 in Torrance, CA after a valiant battle with cancer, open heart surgery and a hip replacement. He joined LAD as an electrical engineer in 1951 after graduating from Kansas State University and retired with 40 years of service. An accomplished engineer, his other passion was being a clown. He attended Clown College in Lacrosse, Wisconsin and won many awards at clown conventions. He used his talent to bring laughter to schools and retirement homes. He is survived by his wife Shirley.

KIKENDALL, LLOYD C., 87 – of Las Vegas, NV passed away on January 22, 2009. Lloyd retired from LAD in 1979 after 32 years of service as a facilities engineer. He continued as a consultant for ten more years. He is survived by his loving wife Geraldine.

LAXTON, EUGENE F., 81 – passed away on Saturday, February 28, 2009 in Torrance, CA due to complications from pancreatic cancer. Eugene had a distinguished career as an aerospace engineer for 35 years. He worked for many companies including NAA/RI and eventually retired from Boeing in 1993. He was part of the B-1 design team which was awarded the R. J. Collier Trophy in 1977 for outstanding achievement in Aeronautics. His wife of 57 years, Cecilia preceded him in death.

MACIAS, VERA L., 83 – died peacefully in April 2009 at her home in Tustin, CA surrounded by her family. Vera worked as an administrative secretary at NAA/RI for 10 years before she retired.

McCLANAHAN, CONNIE B., – of Temecula, CA died on February 25, 2009 of complications following surgery. She served for 35 years at NAA as a mechanic, retiring in 1987. Connie worked on the T-39 Sabreliner, the B-1, and the Space Shuttle. She is survived by her husband of 42 years, Clifford.

MINNER, CLIFFORD R. "BOB", 83 – died at home in Missoula, MT. Graduating from high school, Bob joined the Navy and ended up flying missions in the South Pacific as Plane Captain with Patrol Bombing Squadron 106, Crew 19. Getting a degree in biology, he taught science courses at El Camino College in Torrance before moving into flight test engineering. He worked on several aircraft projects including the F-15, B-52, B-70, B-1A, B-1B, and B-2. He managed test programs at the White Sands Test Track, Holloman AFB, Edwards AFB, and the Microwave/Randome Test Facility in Lamont, CA. He retired from LAD in 1986 after 25 years of service. He is survived by his loving wife of 60 years, Madelyn.

MURRAY, MAURICE, 78 – succumbed to prostrate cancer during the latter months of 2008. He worked at LAD in Quality Control and Purchasing on multiple programs including the B-1 bomber. He is survived by his wife and an extended family.

NELSON, ELMER O., 90 – passed away peacefully on October 27, 2008 after a long illness. He worked at NAA/RI on all of the NASA Apollo space vehicles. He is survived by his wife of 65 years, Lola.

O'LEXEY, JINX C., – of Henderson, NV. Bulletin reminder returned stamped "Deceased". Jinx retired from the Space Division in 1993 after 21 years of service.

ORGILL, JEANETTE R., – died quietly in her sleep at Apache Junction, AZ on February 14, 2008. The information was made available after her name appeared in the "Lost Sheep" section of the Bulletin. Jeanette worked at LAD and the Corporate Offices where she edited the Fortran Volume of the Corporate Computing Manual. She retired in 1973 after 23 years of service.

SALISBURY, GERALD E. "JERRY", – of Torrance, CA. The Spring Issue of the Bulletin returned stamped "Deceased". Jerry retired in 1984 after 35 years of service.

SILVERMAN, STEVEN L., 55 – passed away at his home in Seal Beach, CA on February 9, 2009. Although born with severe cyanotic heart disease he earned a M.S. degree in Aeronautical Engineering from the University of Virginia. He joined NAA/RI and served for 25 years in Systems Integration. During that time, he managed a full and successful life although he had to endure eight intrathoracic surgeries and a heart transplant. He will be sadly missed by his family, friends, and co-workers.

THOMPSON, EULA "TOMMIE", 92 – succumbed to congenital heart failure on March 29, 2009 in Goldsboro, NC. She retired from LAD in 1980 after 35 years of service in Quality Control.

THOMPSON, IVAN E. "TOMMY", 91 – passed away in Glendale, AZ on September 7, 2008. He joined LAD in 1947 in Tooling, later transferred to Rocketdyne where he served as a tooling engineer. He retired in 1977 as Manager of Tooling, Second Shift. He is survived by his wife Ardith.

VANCE, ARMETTA C., 85 – passed away in West Linn, OR as a result of a stroke. She had retired from the B-1 program at LAD in 1986 after 29 years of service including prior assignments at Autonetics, Space, and Seal Beach. Never allowing herself to grow old, her passion was riding on a Harley-Davidson motorcycle.

WATANABE, HIDEO, 80 – passed away on February 17, 2009. A resident of Santa Monica, CA, he was active in the Management Club when he retired from the B-1 Division after many years of service. He later went on to work on the B-2 program at Northrop-Grumman.

WEINER, FREDERICK, – passed away peacefully on March 12, 2009. Fred worked in aerospace engineering for many years before retiring from LAD in 1984 after 35 years of service. His wife of 53 years, Selma, preceded him in death.

WOLFORD, LILLIAN M., 87 – died peacefully on March 1, 2009 after three years of failing health. She was employed at NAA/RI on two separate occasions during her working years. She was preceded in death by her husband, Leonard, a retired U.S. Marine.

ZEHALA, WILLIAM J., 78 – of Columbus, OH passed away on January 27, 2009. Bill joined NAA at the Columbus facility as a civil engineer after receiving a B.S. degree in Civil Engineering from the University of Pittsburgh in 1953. He retired in 1989 after 28 years of service. He is survived by his wife Betty.

LOST SHEEP—BULLETIN RETURNED WITH NO FORWARDING ADDRESS
J. A. GARCIA – LAS VEGAS, NV

I APOLOGIZE TO **MARTIN G. "BUZZ" HOLLAND** – In my rush to meet deadlines, I did not check out the late information on the passing of Julius Kany and accepted as fact that he was the last survivor of the original Bald Eagles that trekked across the country from Dundalk, Maryland to Inglewood, California. At the age of 94, Buzz Holland is the last member of that special group and he is very much ***alive!*** I am sorry for this dreadful mistake and I wish Buzz many years of good health and happiness!

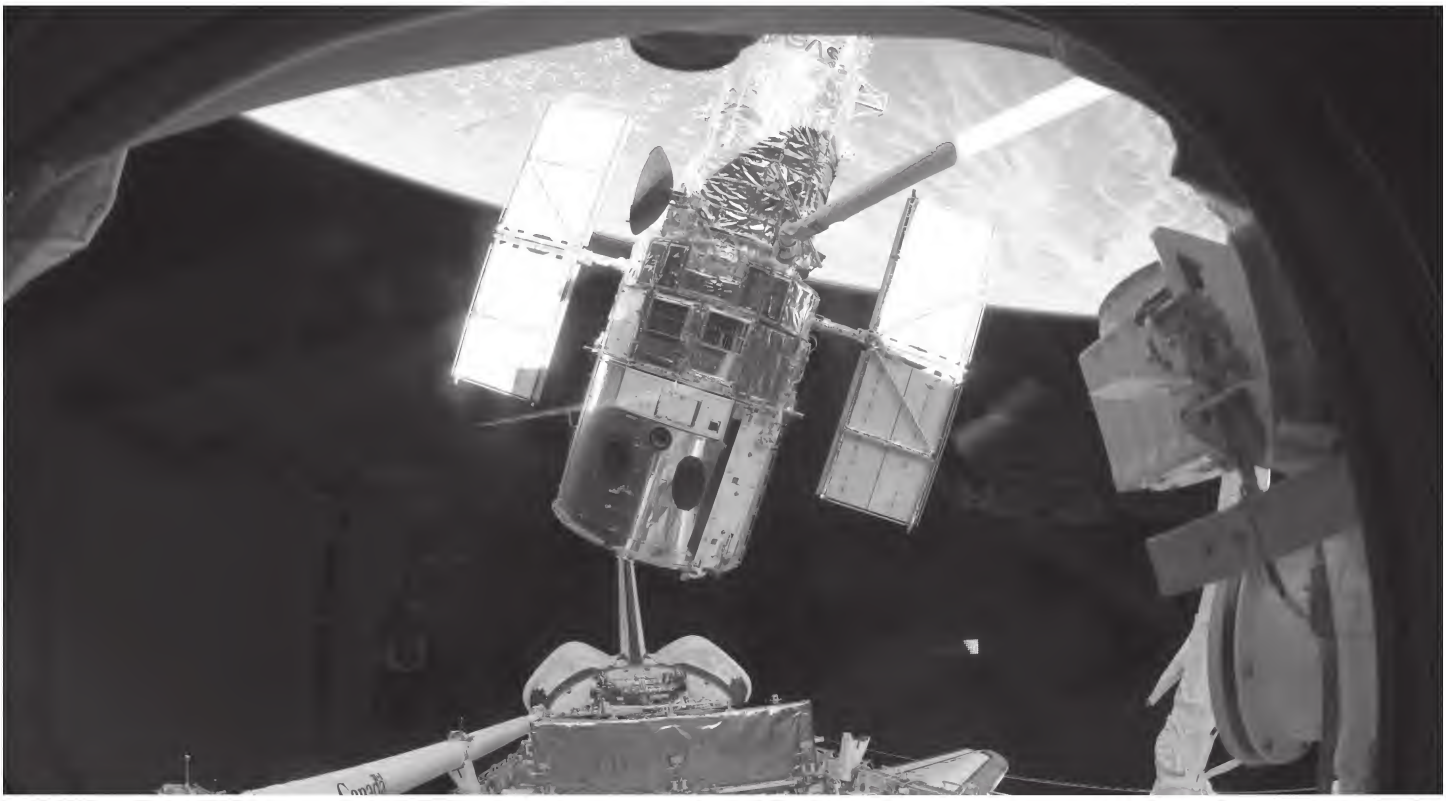
—Ed Rusinek, Editor

NORTH AMERICAN AVIATION
RETIREES BULLETIN
P.O. Box 3797
Seal Beach, CA 90740

North American Aviation Retirees Bulletin

"WHERE THE BEST NEVER REST"

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NASA Photo

The Hubble Space Telescope is lifted out of the cargo bay of Space Shuttle* Atlantis *following completion of the final servicing mission for the orbital observatory. The crew of STS-125 performed five spacewalks to replace and repair HST's batteries, gyros, and cameras to extend the life of the telescope for at least five years. STS-125's crew—Commander Scott Altman, Pilot Gregory Johnson, Mission Specialists Andrew Fuestel, Michael Good, John Grunsfeld, Michael Massimino, and Megan McArthur—returned to Earth May 24, 2009 after a mission duration of 12 days, 21 hours, and 37 minutes concluding one of the final missions of the Space Shuttle Program before NASA retires the fleet in 2010. To the men and women of the Space Shuttle Team, a job well done!

NORTH AMERICAN AVIATION
Retirees Bulletin

Fall 2009

Inside:

INVESTIGATION OF THE SHUTTLE COLUMBIA ACCIDENT by Larry Korb
ENGINEERING THE FUTURE AT ROCKETDYNE by Stephen Evans
FERRYING SHUTTLE ATLANTIS HOME by Jack "Triple" Nickel



NASA Photo

During liftoff of STS-107 on January 16, 2003, a small portion of insulation foam broke away from the External Tank (ET) and struck the left wing of the Space Shuttle* Columbia. *The damage created an opening in the wing's leading edge which caused the orbiter to break apart during reentry into Earth's atmosphere on February 1, 2003 resulting in the loss of vehicle and its gallant crew. This image was on a roll of unprocessed film later recovered by searchers from the debris.

NORTH AMERICAN AVIATION
Retirees Bulletin

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Dear NAA Retirees Bulletin Subscriber

This Fall Issue of the North American Aviation Retirees Bulletin is probably one of the most significant issues we shall ever publish. In the two major technical articles presented, the point is made over and over again: the best engineering minds in the world cannot achieve success if management ignores their recommendations and makes decisions based on factors of mental ineptitude (it is easier to do nothing), schedule precedence, political correctness, or financial preference (show me the money).

Our Materials expert and long time colleague on the Space programs, Larry Korb, was invited to serve on the team investigating the shuttle Orbiter *Columbia* breakup during reentry. His detailed report, a fantastic reflection of his thoroughness, provides a detailed analysis of what happened prior to disaster, how calamity could have been avoided or at least minimized and how the tragedy developed into loss of the vehicle and the superb crew. This report will not entertain you but it will provide you with an intelligent insight on how nothing can be left to chance!

When we think of rocket engines, we think of Rocketdyne—big, bigger, and biggest; powerful, more powerful, and even more powerful! That certainly was Rocketdyne! However, in the midst of their successes on the launch pad, the brilliant scientists and engineers at Rocketdyne realized there was only so much demand for rocket engines, so they looked in other directions to channel their tremendous intellectual and technical capabilities. Stephen Evans provides us a head on summary of the many efforts expended to broaden the technical product base. The technology was there, the resulting hardware was even there but the resolve of governmental overview came up short! As Mr. Adlai Stevenson said when he lost his bid for the Presidency, "I am too old to cry and it hurts too much to laugh."

How many of us have watched the Space Shuttle Orbiter being ferried atop the NASA 747? Dating back to the initial Enterprise drop tests, many of us have seen the 747 take off from Edwards AFB with a shuttle on its back and lumbering into the sky. Our colleagues at Kennedy have seen this fantastic configuration of airplane and spaceship come in for many neat landings. It has become so routine that we have given it little notice. Well, this time the 747 pilot has provided us with a wonderful description of what is like to fly this huge combination. Jack "Triple" Nickel, a former USAF fighter pilot and no stranger to cockpits, describes the experience of piloting this odd couple. Although he injects a bit of humor in his story, it is obvious that he is leaving nothing to chance while in the cockpit. We heartily enjoyed his account of the ferry flight and we think you will concur!

WE ARE AT THE CROSSROADS FOR THE FUTURE!

As the year draws to a close, we are giving our future financial situation very close scrutiny. The staff of the Bulletin is composed of five volunteers and we draw no stipend. All of our authors, many of them professional writers, have graciously donated their time and talent to the Bulletin because of their respect for who we once were. We have held the original yearly subscription rate of $10.00 for ten years, and even increased the quarterly issues from 16 to 20 pages. In that period, we have been evicted from our Boeing office in Seal Beach and denied access to our mailbox on the site. Our only remaining connection to Boeing is an incoming phone line. We have no home office. We also have no grandiose illusions that our Bulletin bears the cachet of a commercial publication. However, it does reflect the love and memories that we hold for what was once "Our Company". We operate from a P.O. Box in the Seal Beach Post Office and we have the sagacity to survive and continue to publish this Bulletin. After all, we are North American Aviation!

Over the years, we managed to absorb the growing costs of printing, addressing and postage. However, unfortunate for all of us, we are also the checkout generation and too many of our members have slipped away to the Silent Majority. As a result, the number of subscribers continues to diminish yearly and the cost per subscriber has now risen to the point where we must impose an increase in the cost of the subscription. To maintain some financial stability, we are considering an increase to $15.00 per year for all new and renewed subscriptions. However, before we make a final decision, we are asking for your inputs. So please let us know how you feel about this change. Just drop us a card or note!

Thank you for your support in the past. It is always an honor to be representing the North American Aviation Retirees.

The Failure Analysis Of The Columbia *Spacecraft Accident*

by Larry Korb, Dedicated to the Crew of STS-107

Prologue

The Space Shuttle is truly a remarkable vehicle. The Space Shuttle Orbiter has launched satellites, space probes (Magellan, Galileo) and solar probes (Ulysses). It has rendezvoused and docked to the Mir Space Station on 11 different occasions and has launched 28 Spacelab and Spacehab modules for scientific investigation. It has placed the Hubble telescope in orbit, and recaptured and refurbished it on 5 different occasions. It has orbited modules of the International Space Station (ISS) which have been assembled in space, as well as having provided servicing and supplies to the ISS.

When we were designing the Space Shuttle Orbiter, it seemed unreal! Imagine a spacecraft with a cargo bay 15 feet in diameter and 60 feet long, capable of carrying 65,000 pounds, being flown well beyond Mach 24 during entry, through the hypersonic, supersonic, and subsonic regimes and eventually landing as the world's heaviest glider, for it has no functional main propulsion engines during entry and landing. Prior to the Shuttle Orbiter, the X-15 held the manned speed record for aircraft at Mach 6.7 (4,519 mph).

Advancing the state of the art always comes with risk. The Orbiters have flown 127 missions (as of July 2009), but we lost two orbiters, the *Challenger* and the *Columbia*, along with 13 astronauts and one school teacher. Sadly enough, the loss of both vehicles and crews could have been prevented had program management respected the advice of the engineers. For example, in the case of the *Challenger*, engineers working with the Solid Rocket Boosters (SRBs) advised program management that the seals were too stiff and brittle at the low temperatures of the launch and would result in blow-by of hot gases, which could ignite the External Tank (ET). The engineers recommended holding up the launch until air temperatures reached about 40°F, only to be overruled by those above.

In the case of the *Columbia*, over-confident program management overruled the Debris Assessment Team which wanted the Air Force to obtain on-orbit photos of damage to the *Columbia's* thermal protection system. This would have given them a chance to evaluate the seriousness of foam impacts noticed in films reviewed a day after the launch. Had this been done, a rescue mission by the Shuttle Orbiter *Atlantis*, which was in the Vehicle Assembly Building, could have been made, saving the lives of the astronauts. The *Columbia* could have been left in orbit, a repair could have been subsequently developed, and then the *Columbia* could have been landed by existing avionic controls. After all, the Russian *Buran*, a copy of the Orbiter, did not carry any cosmonauts on its initial (and only) flight and was landed by its own avionics.

After the *Columbia* accident, I had the opportunity to be on the NASA Hardware Forensic Team. Our assignment was to investigate the location and cause of the failure. I thought I'd like to share with you some of the findings we uncovered during this investigation.

The Accident

The Space Shuttle Transportation System is the first and only reusable manned space system in the world. In its launch configuration, it consists of four major components: a manned Space Shuttle Orbiter (SSO), an insulated External Tank (ET) carrying liquid oxygen and liquid hydrogen fuels, two Solid Rocket Boosters (SRBs), and three Space Shuttle Main Engines (SSMEs) mounted on the orbiter which burn the liquid propellants supplied by the ET. The system is capable of orbiting 4 – 10 astronauts and 65,000 pounds of cargo, then reentering and landing like a commercial aircraft. On January 16, 2003, the *Columbia* Orbiter spacecraft was routinely launched into orbit on Mission STS-107, manned by a seven-member crew. This flight was the 113th launch of the Space Shuttle System and the 28th launch of *Columbia*. One aspect of the launch was not routine. Two cameras recording the launch, located 17 and 26 miles from the orbiter, clearly showed that at least 2 pieces of the ET insulating foam broke loose and struck the left wing of the vehicle at an extremely high speed approximately 81.9 seconds after launch. The size of the largest piece of foam was estimated by NASA at the time to be 20 inches by 16 inches and 6 inches thick. (It was later established by NASA to be approximately 24 inches by 15 inches and 3 inches thick.)

Because of its size and relative velocity, the foam impact caused concern and received considerable attention within both NASA's and Boeing's engineering support groups. While the vehicle was on orbit, a special Debris Assessment Team was set up to evaluate whether the impact would threaten the safety of flight. The initial analyses were focused primarily on foam impacting on the lower surface Thermal Protection System (TPS) tiles somewhere aft of the wing leading edge, because the tiles are more vulnerable to damage than the leading edge. (Tiles have a minimum tensile strength of 13 psi, whereas the reinforced carbon-carbon on the leading edges has a bending modulus of rupture of 9,040 psi.)

The possible consequence of an impact on the leading edge, however, was also evaluated at Boeing Houston. The Debris Assessment Team requested on-orbit pictures be taken to verify the integrity of the TPS; however, the effort was canceled by program management. Subsequent assessment, under pressure from the program office, concluded that the vehicle would



Figure 1. The Columbia was impacted by BX-250 polyurethane foam pieces shed by the External Tank about 81.9 seconds after launch. Two to three pieces may have been involved.

have a safe return. The Boeing impact experts at Seal Beach were not consulted on this decision and would certainly have insisted on pictures. On February 1, 2003, after 17 days in orbit, the *Columbia* vehicle began reentry into the atmosphere (at 400,000 feet). Fifteen minutes and 23 seconds later, while *Columbia* was traveling at Mach 19 at an altitude of 200,000 feet, all transmissions were lost from *Columbia* and its 7-member crew. A picture taken at Kirkland Air Force Base prior to breakup, subsequently provided evidence that the *Columbia* had disturbed flow on the left wing.

Orbiter Thermal Protection System

The Thermal Protection System (TPS) on the Space Shuttle Orbiter consists of several different materials. Two of these were of greatest interest to the investigation-the tiles on the underside of the Orbiter and the reinforced carbon-carbon (RCC) on the nose and leading edges. The purpose of the thermal protection system is to radiate over 80% of the heat of reenty and either to insulate (tiles) or to conduct away the other 20% (RCC). The RCC requires that subsequent insulation packages be inserted between it and the vehicle structure. It is essential that tiles and RCC keep their aerodynamic shapes for 100 flights. The key to a successful TPS is to avoid tripping the aerodynamic boundary layer until well past the peak heating regime, for tripping the boundary layer results in turbulence that can elevate TPS temperatures by >500°F. Gap fillers made from ceramic cloth are placed between the tiles to help insure smooth laminar flow.

Tiles are made from pure silica filaments 1/8th inch long and roughly 1/40th of the diameter of a human hair. The filaments are mixed with water, forming a slurry, and vacuum-filtered, resulting in a wet cake. This cake is subsequently baked at about 2,500°F to allow the fibers to become "sticky" and to bond to each other. Tiles are cut to size and then spray-coated with a glass frit and fired, resulting in a 0.009 to 0.015-inch thick glassy protective layer. The tiles on the underside of the Orbiter are coated with a thin film of dark borosilicate glass (containing silica tetraboride) which gives it the ability to emit more than 80% of the reentry heat back into the atmosphere.

Tiles were manufactured in two densities, 9 and 22 pounds per cubic foot (pcf). The 9 pcf tiles (LI-900) are used to protect the vast area of the underside of the Orbiter, whereas the 22 pcf tiles (LI-2200) are used where some strength and damage resistance is required, such as around doors and openings. The LI-900 tiles are 93% void and have an allowable strength of 13 psi, whereas the LI-2200 tiles have an allowable strength of 50 psi. Thus, you can see these tiles are easily damaged. Both LI-900 and LI-2200 tiles are good for continuous temperatures of 2,300°F. LI-900 tiles can survive excursions to 2,600°F, whereas LI-2200 tiles can survive excursions to 2,900°F.

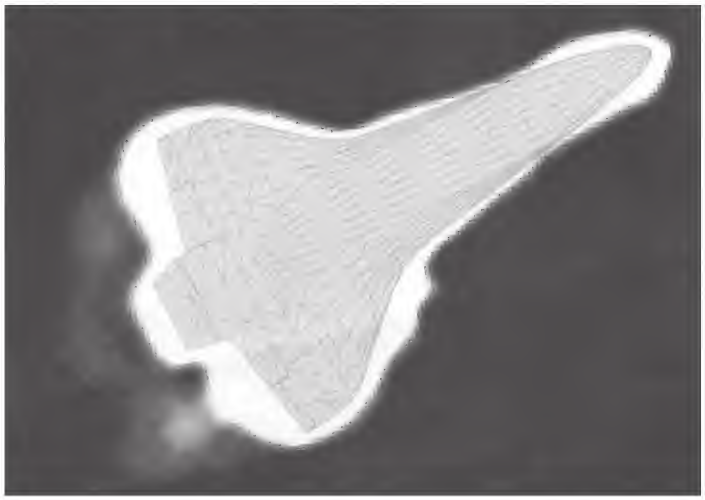


Figure 2. Disturbed air flow on* Columbia's *left wing early in the reentry.

The majority of the LI-900 tiles on an orbiter may be anywhere between ~1 and 4 inches in thickness, depending on the heat expected in a particular vehicle location. They are mounted on nylon (Nomex) felt pads (strain isolation pads or SIP) which are 0.160 inch thick to reduce loads on the tile as a result of vehicle bending, moldline mismatch stresses, thermal stresses, etc.

The nose cap and leading edges of the Orbiter are made from reinforced carbon-carbon (RCC). These parts are formed by a layup of rayon fabric in an epoxy matrix. After curing, this layup is heated to about 3,300°F to graphitize the materials. The layup is repeatedly impregnated with furfuryl alcohol and re-graphitized to densify it. Finally, the exterior is packed in silica and heated to graphitizing temperatures to coat the exterior with an oxidative protecting, silicon carbide coating about 0.025 inch thick. RCC is hard and brittle, having about the same strength as the Orbiter glass windshields. Thermal cracking of the coating on RCC panels occurs during cooling from coating temperatures due to the differences in coefficients of thermal expansion between the silicon carbide coating and the RCC substrate. These cracks are subsequently filled with a tetraethylorthosilicate (TEOS) solution and heat-cured, resulting in deposits of pure silica in these fine cracks.

On top of the silicon carbide, a low-melting glass coating provides additional protection during entry, sealing these fine cracks in the surface shortly after reentry heating. RCC panels, typically 0.34 inch thick, can withstand over 9,000 psi bending stresses. In service, RCC can operate continuously at 2,960°F and survive short periods at 3,220°F.

The Accident Investigation

The loss of any manned spacecraft, by law, immediately triggers an investigation by an independent agency. This investigation was carried out by the Columbia Accident Investigation Board (CAIB), headed by Admiral Harold Gehman, Jr. The CAIB included prominent military officers, FAA and scientific experts, as well as an astronaut, and was supported by a staff of more than120 people, including secretaries and consultants.

A separate and parallel effort consisted of an integrated engineering technical team of NASA and Boeing engineers called the Orbiter Vehicle Engineering Working Group (OVEWG). It included more than 400 engineers with extensive Orbiter design and analysis experience. It focused almost entirely on the technical cause of the accident. This group was independent of the CAIB, but did share information with them as the investigation progressed.

The enormity of the investigation is noteworthy. Some 30,000 documents were examined, 200 personal interviews were conducted by the CAIB, more than 3,000 inputs from the general public were reviewed, and testimony from dozens of expert witnesses was elicited. A "volunteer army" of more

than 25,000 people walked along the 9-mile wide by 525-mile debris path extending from Littlefield, Texas into Louisiana. More than 82,000 pieces of the Orbiter were recovered, their locations (longitude and latitude) were recorded, and these pieces were sent to the Shuttle Landing Facility (SLF) at the Cape Kennedy Space Center. Each structural or TPS fragment was measured, compared to drawings for identification and vehicle location, then labeled and laid out on the hanger floor in its correct vehicle location.

Numerous teams were set up within the OVEWG, such as those to analyze photographic evidence, to reconstruct a master timeline of events, to conduct fault tree analyses, to review documentation, to review instrumentation readings, to conduct additional analyses, to conduct additional testing in various technical disciplines, to review possible foam impact scenarios, and to provide a forensic analysis of the debris collected. Two separate impact analysis teams were active – the NASA /Boeing Houston Impact Analysis Team which eventually developed a computational analysis method for predicting the damage from a foam impact on the leading edge, and the Boeing Huntington Beach (HB) Impact Team which derived a strength-of-materials based impact analysis method.

Because the *Columbia* had survived structural loads during launch which were ten times greater than those experienced during entry, it was concluded that the orbiter TPS had been compromised prior to entry. As previously mentioned, two major materials are employed on the Orbiter TPS lower surface:

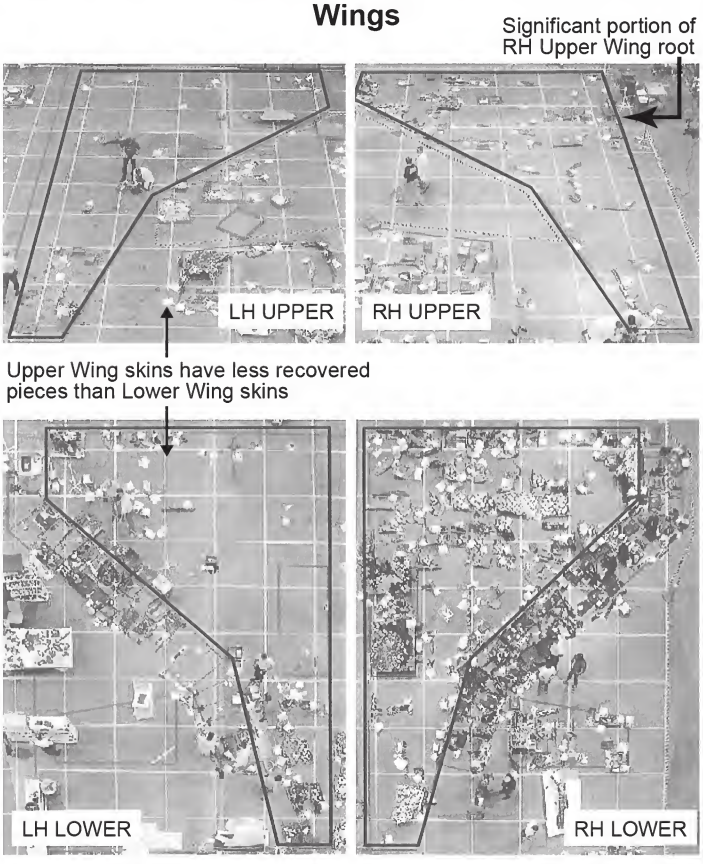


Figure 3. Pieces of the left and right wings are laid out on the floor of the Shuttle Landing Facility. Note how few pieces of the left wing were recovered.

pure silica tiles of two strength levels with densities of 9 and 22 pounds per cubic foot, and reinforced carbon-carbon (RCC) for the high-temperature applications at the wing leading edges and the nose cap. Ten possible locations for TPS failure were identified and considered by an OVWEG Scenario Team. All recorded instrument data and analysis data were reviewed to accept or reject each scenario. The instrumentation, aerodynamic behavior, and photography indicated that failure must have initiated on the left wing.

The OVEWG Hardware Forensic Team examined the collected debris in detail at KSC to identify the location of the initial TPS breach. This team consisted of retired Boeing Materials and Producability experts (including the author) and a NASA aircraft failure analysis expert and was supported by a retired Boeing TPS Design Director. The team reported to NASA leader Julie Kramer-White. The Boeing Huntington Beach Impact Analysis Team closely supported this effort.

NASA Hardware Forensic Team Findings

Three major problems were encountered during the forensic analysis. First, day-by-day, newly-found parts were arriving on the hanger floor. By early March about 2,200 parts of the TPS and the orbiter structure were displayed, but a month later, the total had grown to ~3,200 parts. Second, virtually all parts showed evidence of burning, melting, or overheating due to entry, and often multiple impact damage from the disintegration of the spacecraft and striking the ground. Third, many parts were either missing or just a few pieces of them were recovered.

Initial efforts were made to assess the possibility that the left-side main landing gear door had accidentally opened, causing the accident. Because lugs on the back side of the left Main Landing Gear (MLG) cylinder were melted (steel alloy 300M), it was obvious that the door had not opened (which would have resulted in melting of the front side). Further, examination of the scraps of the left MLG door showed that plasma flow exited the door at the corners, melting tiles locally. Based on these observations, the NASA Hardware Forensic Team was quickly able to eliminate this scenario.

Damage to parts on the left wing was compared with damage to similar parts on the right wing, as a control. By the latter part of March, the HB Impact Analysis Team was alerted by the NASA Hardware Forensic Team that failure appeared to have occurred in the RCC panels and an impact analysis of the RCC was initiated (see next section). On April 2, the OVEWG Forensic Team and three CAIB team members met and concurred that the initial TPS breach occurred within a few inches of the left hand RCC Panel #8 - #9 interface. Supporting this finding, preliminary analysis results from the impact analysis conducted at Huntington Beach showed that the foam had more than enough energy to breach an RCC panel.

On April 22, a 3-D table-top mockup of the existing pieces of RCC Panels #8 and #9 enabled the NASA Hardware Forensic Team and the three CAIB members (assisted by an aerodynamicist from NASA Ames) to confirm that the breach occurred in the lower surface of RCC Panel #8. Four major observations lead to this conclusion.

First, examination of the left-wing leading-edge RCC panels revealed the inside surface of the panels from #4 through #10 were sprayed with molten metal. The bottom layer of metal

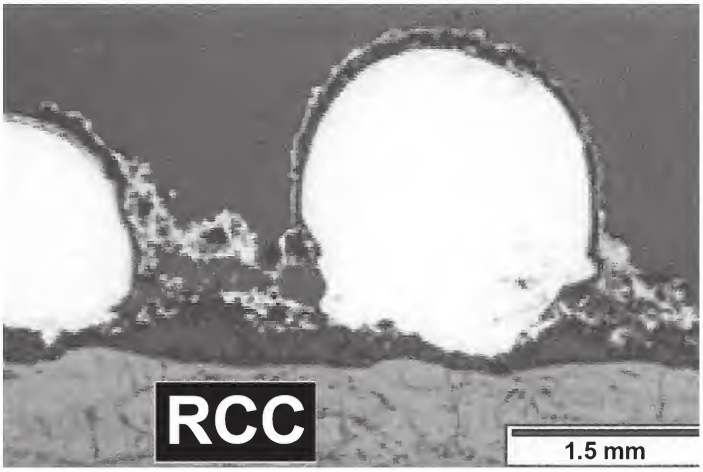


Figure 4. Molten metal sprayed inside RCC panels #4-10. Analysis indicates nickel-base alloys (fasteners) and iron-base alloys (fittings) were first to deposit, followed by ceramic insulation (Cerachrome) and finally aluminum from the leading edge spar.

spray consisted of a nickel-base alloy (Inconel 718), or an iron-base alloy (A-286), covered by a ceramic layer and by an aluminum 2000-series alloy layer. The nickel and iron came from melted fasteners or attachment fittings and the aluminum from the honeycomb sandwich structure of the forward spar. The ceramic was part of the insulation protecting key metal parts behind the RCC leading-edge panels. This suggested that failure occurred between RCC Panels #4 and #10.

Second, the aft attachment lug holes in RCC Panel #7 through the forward RCC attachment lug holes at Panel #10 were intact. This indicated that the Inconel fasteners had melted out (>2,500°F) and that the temperatures in this region were far beyond those expected in service (maximum of 1,200°F). Thus, the initiation site was narrowed to RCC Panels #7 to #10.

Third, severe melting of the forward inside corner of the 22-pcf carrier panel tiles behind RCC Panel #9 occurred. The aft portion of Panel #8 was missing, but examination of a similar panel revealed that a vent hole, normally plugged by a ceramic gap filler, allowed hot gases from Panel #8 to impinge on these tiles behind RCC Panel #9. This indicted RCC Panel #8 as the failure location.

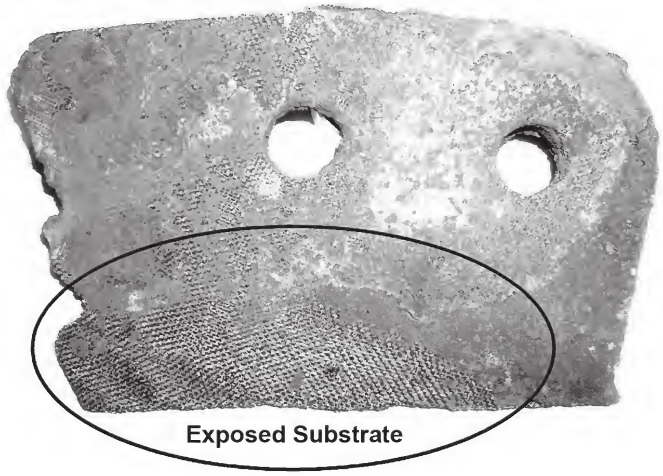


Figure 5. Note that the lug holes are intact indicating fasteners melted out of them. (Inconel, >2500°F)



Figure 6. A dummy piece of RCC (upper middle and left side) shows a drain hole in RCC panel #8 (dark spot in exact center of figure) would line up with the erosion notch in the tile just adjacent to RCC Panel #9 (below center of picture). Temperatures to cause this erosion were estimated to be above 3,100°F for a considerable length of time.

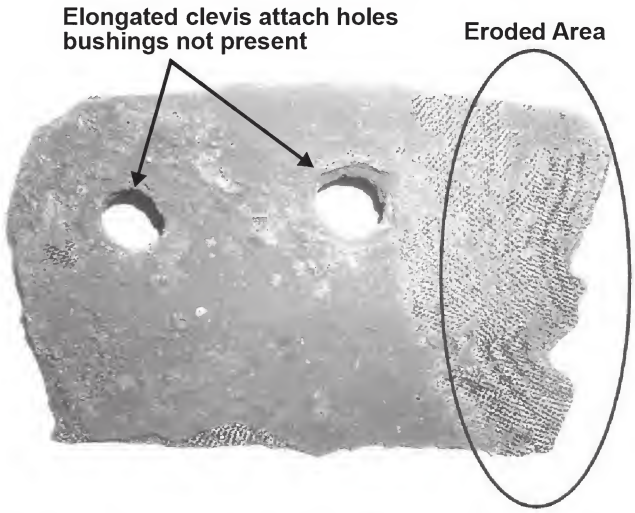


Figure 7. Notice the lug attachment holes from a piece of RCC Panel #8 (inside, downstream flange) are intact, as in Figure 5, indicating that the fasteners did not break out of the holes, but were melted out. Also notice the plasma stream eroded the flange down to a knife edge.

Finally, the aft surface of the side flange of RCC Panel #8 and the forward surface of the side flange of RCC Panel #9 had been eroded by plasma at temperatures thought to exceed 3,300°F.

These panels were eroded by the plasma from the upstream side, whereas the downstream side (backside) showed no evidence of attack except where burn-through occurred. This clearly showed the inside of RCC Panel #8 was the hottest location on the vehicle, about 2,000°F beyond any thermal predictions. Based upon this, the NASA Hardware Forensic Team estimated that RCC Panel #8 had a hole in it 8 to 12 inches in diameter.

It was further shown by the movies that the trajectory path of the foam crossed RCC Panel #8 and that the analyses of all available instrumentation data supported this scenario. In addition, the impact analysis of the Boeing HB Impact Analysis Team showed that, indeed, an impact of a foam projectile of

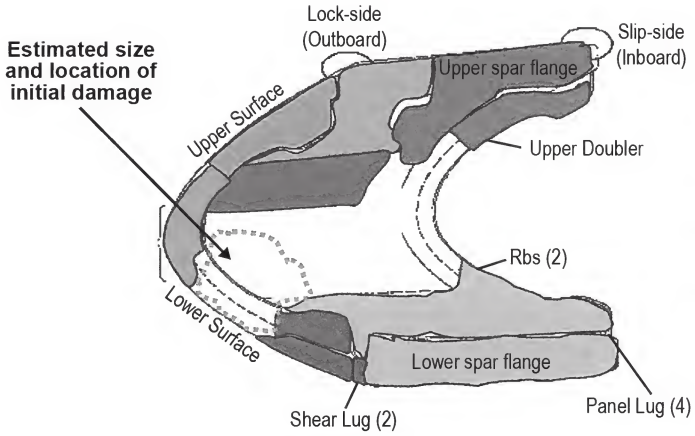


Figure 8. NASA Hardware Forensic Team's estimate of impact damage. (Lower gray pieces shown in figure were never found, as well as pieces in the white areas.)

the estimated size, measured impact velocity and impact angle could breach the RCC leading edge panels.

At this point there was considerable skepticism by engineers and upper management at both Boeing and NASA. How could a piece of foam, whose density is 1/26th that of water, put a large-sized hole in the wing leading-edge? After all, the Orbiters sustained more than 16,000 damaging tile impacts, and undoubtedly a number of impacts on RCC leading edge panels in the previous 112 flights without compromising any orbiter TPS. It was concluded that testing would be required to demonstrate the viability of this RCC foam-impact scenario.

Analysis

While the analysis of the impact was rather complicated, Al Richardson of Boeing was able to compute the stresses in the RCC panels that would result from deflection due to the impact of foam pieces. The foam has a density of ~2.5 lb per cubic foot, weighed only 1.6 lb, but when traveling at an estimated 775 feet per second, it had an amazing 15,000+ ft-lb of energy. (Kinetic Energy = 1/2 mv^2, where m is mass and v is velocity.) The RCC panel broke because its deflection was exceeded locally. Think of the analogy of a football being kicked into a plate glass window. Although the football is softer than the glass, at a high enough velocity, it can deflect the glass and break it. The amount of energy transferred depends on the angle-of-attack, whereas the deflection also depends on the distance of the impact from the stiff side flange supports of the RCC panel. Richardson was able to plot maximum panel stress (center of support area) versus angle of attack with various weights of impacting foam. His calculations indicated that a 1.5 lb piece of foam, traveling at 775 feet per second and impacting at an angle of attack of 8º or greater at the panel center was sufficient to exceed RCC panel deflection limits.

Engineering Test

In spite of the analysis, the CAIB insisted that a full-scale test be run on a #8 RCC panel using the correct foam density, speed, and weight. This was carried out at Southwest Research Institute in San Antonio, Texas. The results confirmed the analysis and demonstrated that the foam impact was the cause of the RCC damage which resulted in the failure of the *Columbia* during reentry.



Figure 9. Foam impact testing of RCC Panel #8 with the correct foam, weight, velocity, and possible angle-of-attack reveals the foam impact deflected the panel sufficiently to cause a large hole. On the* Columbia*, such a hole would result in loss of the vehicle.

Summary

Prior to the STS-107 flight, the thermal protection system of the Space Shuttle Orbiters, though easily damaged, had shown remarkable damage tolerance, as demonstrated by having survived over 16,000 prior TPS impacts without resulting in a vehicle loss. One can never become complacent, however, for continued success often brings false confidence. In the case of the STS-107 *Columbia* mission, movie films examined the day after the launch clearly showed that *Columbia* was impacted by some large pieces of foam. The estimated impact energies were considerably higher than ever experienced before and a TPS on-orbit inspection or on-orbit photos of the damage should have been obtained for evaluation. After the loss of the *Columbia*, a thorough investigation by the Orbiter Vehicle Engineering Working Group, the NASA Hardware Forensic Team and the Boeing Huntington Beach Impact Team were able to establish that a hole was put in the RCC leading-edge Panel #8 by the impact of one or two large pieces of foam separated from the External Tank soon after launch. While the density of this foam was only 1/26th that of water, its impact energy was calculated to be over 15,000 foot-pounds. In spite of these analyses, skeptical engineers were not convinced that foam could do such damage until an engineering test clearly demonstrated that the foam impact was the cause of the failure.

About the author: Larry joined the NAA Space Division at Downey in 1959. He was Engineering Supervisor of Materials and Producibility on the Apollo Program from 1962-1966, Supervisor of Advance Materials Development from 1967-1972, then spent his next 16 years as Supervisor of Metallurgy, and later Supervisor of Thermal Protection Materials on the Space Shuttle Orbiter Program. After he retired, he spent the next 17+ years consulting at the Space Division for Rockwell, McDonnell Douglas, and later Boeing. After the Columbia *accident, he became a member of the NASA Hardware Forensic Team, assigned to locate the origin and cause of the* Columbia *failure.*

Engineering The Future At Rocketdyne

by Stephen A. Evans

The amazing history of the contributions of the Rocketdyne division of NAA/RI to rocket propulsion, national defense, space exploration and the world changing space infrastructure that we rely on every day has been well documented in books, articles and in this publication. Less documented are the many non rocket engine projects both successful and unsuccessful that Rocketdyne undertook. Some of these projects have become growth markets for either Boeing or Pratt & Whitney Rocketdyne. Many of the talented people at Rocketdyne contributed to these efforts.

As the frantic pace of the initial space and missile programs peaked with the Apollo Moon landings, Rocketdyne's employment peaked around 22,000 and started to drop rapidly. The follow-on Space Shuttle was still only a NASA wish. The management in Rocketdyne's Advanced Programs knew that we had to look outside of rocket propulsion for future business, just as NAA had expanded to other fields like rocket propulsion, launch vehicles, guidance and nuclear power as the core aircraft manufacturing business declined after WWII. NAA had also shown the way with the NAAVAAN commercialization effort that resulted in ideas like the famous rain fountain in Topanga Plaza mall. Later rounds of searches for new markets followed completion of the development phase of other major programs like the Space Shuttle Main Engine. The planned reliance on the Space Shuttle for all launches and the phase out of expendable vehicles made new rocket engine programs unlikely at that time. Ironically, Pratt & Whitney approached Rocketdyne offering to sell their rocket engine product line. Since their only product was the RL-10 upper stage engine for expendable launch vehicles, Rocketdyne declined. If we had bought P&W's rocket business the spinoff of Rocketdyne to P&W by Boeing would have been unlikely.

The engineering competencies gained through building rocket engines included cooled structures for extreme temperatures and heat fluxes, efficient high pressure combustion devices, high temperature gas flow in supersonic nozzles, compact high-pressure high flow rate turbopumps, handling of cryogenic fluids, computerized engine control systems, test systems, and various materials and manufacturing methods. At various times of declining core business, Rocketdyne looked for ways to expand these capabilities into new programs and products.

Wastewater Systems

One of the earliest and financially most successful commercialization projects for Rocketdyne technology involved application of wastewater management learned through water handling at the rocket test stands. The technology was first applied to the problem of wastewater management at coalmines. The product line was spun off into a new company named Envirotech along with some of the key managers and engineers. The rumor was that we made more profit on the spinoff than on all our government-funded programs to that time.

Water Jets

Our rocket engine brochures and press releases often characterized our turbopumps in terms of how many Hoover Dams of power were generated in relatively small devices, how many swimming pools could be emptied in seconds and how many thousands of feet into the air water could be shot. Since many commercial industrial systems require fluid flows, we looked for ways to apply our expertise in this market.

Some early ideas like rapid off loading of the then coming on line super tankers or shooting immense jets of water from the ocean onto forest fires lost out at the conceptual phase. The unloading flow rate of supertankers turned out to be limited by pipe diameter and the velocity of flow at which dangerous static electricity build up started rather than pump capabilities. The idea of tons of salt water falling at high velocity from the sky into areas where people and structures might be on the ground coupled with the after effects of the salt residue killed the fire fighting idea.

An idea that went further was the water cannon. The danger of fire and explosions on a carrier deck had been reinforced with the Navy in the incident retold by John McCain during the elections in which he was nearly killed when his aircraft was trapped in an on deck fire. The Navy approached Rocketdyne to see if there was a way to use a water stream from a water cannon to wash the deck clear of burning aircraft and exploding ordinance.

In the ensuing program we developed and tested a turbopump driven water cannon that could clear a carrier deck in seconds. The idea was to have the turbopump in the bowels of the ship and the nozzle mounted high on the superstructure. In a test at the Santa Susana Test Facility, the prototype water cannon blasted a VW van off the side of a cliff. In one frame of the high-speed camera film, the VW is on one side of a canyon and the water jet is just starting from the nozzle of the water cannon on the opposite side of the canyon. In the next frame, the jet is reaching toward the VW and in the next frame the water is splashing off a bare cliff with the VW gone. The concept worked but there were some mortal flaws. First, not only the aircraft but also all the people on deck would be violently launched into the ocean. Luckily for McCain his ship did not have such a system or he would have been killed by the water jet impact or subsequent fall into the ocean. A less obvious even more catastrophic problem was that the reaction to the force of the jet would turn the carrier over in seconds. This problem could have been solved by having a counter jet under water but that led to issues of drag and control.

The water cannon was abandoned but led to other ideas. In examining nozzle shapes for best flow streams, we started with fire hose nozzles. We found that these nozzles were poorly designed and filed a patent for an optimized nozzle that we gave away gratis to fire nozzle manufacturers and fire departments. We used the knowledge gained to move into water jet propulsion. Our relationship with the Navy led to development and production of torpedo ejection pumps, a contract during which we learned how challenging building systems for long use in a salt-water environment is.

The most successful of our forays into building a pump based product line was our trademark line of Powerjet water jet propulsion systems. Other companies like Jacuzzi were starting to make water jets for small sport boats. We addressed large high-speed ship applications. Powerjets were used on oil rig servicing boats, Navy hydrofoil patrol ships and most memorably on the Boeing hydrofoil passenger ships that for a time serviced Catalina from Long Beach, served as ferries in Hong Kong Harbor and as inter-island ferries in Hawaii. Eventually, the Powerjet line was sold to a commercial company.



Boeing Hydrofoil ship powered by Rocketdyne Powerjets

Auxiliary Power Systems

Since our turbines developed immense power in a small package and we were experts in the gas generators that drove them, applying this technology to auxiliary power units for aircraft, ships and land was a natural extension. Unfortunately, there were entrenched capable competitors like Garrett and our efforts never got beyond the R&D contract stage. However, the technology and customer relationships contributed to our entry into the high-energy laser market.

Alternative Energy Systems

The recent run up in oil prices and search for alternate energy sources is parallel to the 1970s. Spurred by that oil crisis, Rocketdyne was involved in a number of potential products to provide alternative sources of energy. We applied our chemistry expertise gained from synthesis of possible rocket fuels to coal liquefaction and coal gasification. We developed and tested a prototype downhole steam generator using our combustion expertise to make oil wells more productive.

Rocketdyne developed the receiver and energy storage system for the Solar I power station near Barstow for McDonnell-Douglas. We applied our knowledge of cooling and heat transfer to the tower mounted heat absorber. The facility can still be seen from the highway and from airline flights. The mirrors and other systems have been changed over the years to test new designs with the later configuration designated Solar II.

Our most ambitious concept was the hydrogen economy in which most prime movers would use our turbines running on hydrogen and air combustion products for motive power giving off environmentally harmless water and nitrogen. We had conceptual studies for the Department of Transportation for hydrogen powered buses and trains.

When the oil price dropped, so did contract money for all these concepts. However, Rocketdyne had already had to hand off most of the work. Our Vice-President of Advanced Programs (now best known for heading the B-1B program and then the corporation) became head of the newly formed Energy Systems Group (mostly Atomics International) and decided Rocketdyne's energy programs should move with him. A "B.C." comic strip at the time showed an ant rolling a grape. In the next panel a bird lands to eat the grape and the ant says: "you can't have it, it's mine." Someone labeled the grape "Rocketdyne energy programs," the ant with the name of the Rocketdyne president and the bird with the initials of the ESG president and posted the doctored cartoons around Rocketdyne. The final panel shows the bird flying away saying "yum that grape was good and there was even an ant on it."

Rocketdyne and later ESG studied most of the ideas for clean, sustainable energy that are now being suggested as solutions for energy independence and global warming. Just as in the earlier crisis, the sudden abatement of oil prices has changed the equation for utilities and other potential investors making a sustained effort to bring these new energy sources online very difficult. For those at Rocketdyne who were involved it is déjà vu` all over again.

Flywheels

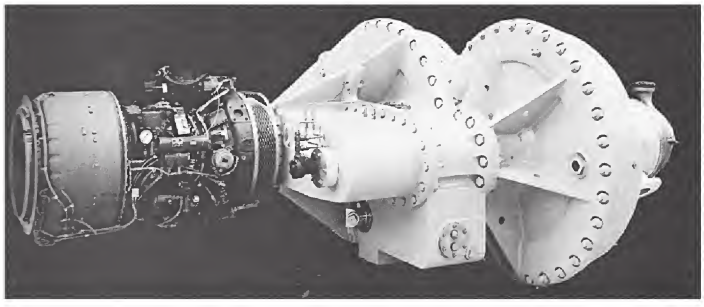
One of the energy storage concepts that stayed with Rocketdyne was the use of flywheels. Initially the application was for power supplies for high-energy lasers. Soon we were looking at uses such as coalmine shuttles, trucks, buses, and even emergency power for hospitals and other buildings. One of the most interesting requests came some years after our original prototypes. The Union Pacific Railroad wanted to store energy from braking their trains coming down the long grade into Los Angeles and use the stored energy to save fuel on trains leaving on the upgrade. A separate locomotive containing flywheels would join the train at the top of the grade to aid in braking by spinning up the flywheels. The locomotive would be detached at the bottom of the grade to await a departing train. It would be attached to the train heading up the grade to provide extra power from the flywheels. The first slide of the briefing they gave us outlining their requirements was the original charter of the Union Pacific Railroad, signed by Abraham Lincoln. Although the studies and tests we ran showed the feasibility of the concept, Union Pacific pursued other approaches.

High Energy Lasers

DARPA, the Navy, the Army, and the Air Force began pursuing the use of high-energy lasers (HEL) as weapons around the time that development of the SSME was awarded to Rocketdyne



Rocketdyne solar receiver at Barstow test site



Turbine powered flywheel system

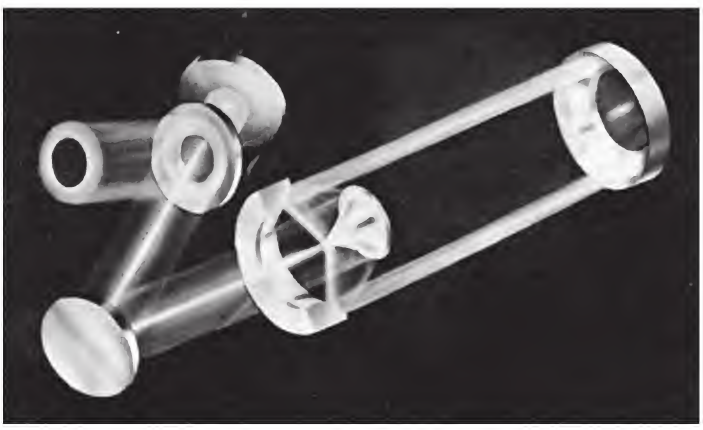
and new propulsion R&D funding had disappeared. The AF approached Rocketdyne as the premier manufacturer of complex high energy density systems to become involved.

Rocketdyne's initial response was that we didn't know anything about lasers, optics or mirrors. When we looked more closely at the laser systems being developed we saw that our technologies directly fit. At that time, solid lasers were limited in power by the temperature rise caused by waste heat. A new type of laser had been developed using flowing gas as the laser medium. The waste heat was exhausted with the waste gas. Energy was added to the gas molecules either by electrical discharge (EDL) or by combustion in gasdynamic (GDL) and chemical lasers (CL). The molecular energy inversion and low pressure necessary for lasing was created by expansion through supersonic nozzles. The structures and mirrors had to be cooled. The exhaust had to be brought back to atmospheric pressure by diffusers and ejectors like those we designed for our test stands. The power for the EDL required a mobile auxiliary power unit. That our rocket competitors Pratt & Whitney and TRW saw this as a big new business area also added interest.

We eagerly jumped into this highly funded new venture. Experts were brought in to retrain our technical staff. Soon many engineers were seen carrying basic texts on lasers. As we started to win programs we began hiring. The laser engineers from Autonetics were transferred to Rocketdyne. One program manager said we were like a kid in a candy store grabbing more than we could digest.

Rocketdyne was the only company pursuing all types of HEL. The lasers were characterized by the molecule that lased and set the wavelength of the light emitted. The initial lasers used carbon dioxide, hydrogen fluoride, or deuterium fluoride. Later carbon monoxide and iodine were used. The current Airborne Laser Program (ABL) uses a chemical oxygen iodine laser (COIL) named for the oxygen to iodine molecular energy transfer that it uses. The fact that we had different teams pursuing different concepts led to some friendly rivalries and occasional more heated confrontations over priorities on resources.

The Laser Programs Organization was quite successful in winning programs to supply hardware for the Airborne Laser Laboratory (ALL) predecessor to the ABL, a very large CL program named Sigma-Tau, an electrical laser program named EMRLD and some classified programs. However, we lost key programs like the space based ALPHA and the ABL for which we were part of the Rockwell team that lost to a Boeing team that included TRW for the laser and Lockheed-Martin for optics.



Sigma-Tau Optical System

When Boeing bought NAA, the Rocketdyne laser team was immediately put to work helping Boeing manage the development of the ABL, overseeing and helping our ex-competitors who were on the Boeing team. Lasers remained with Boeing when Rocketdyne was sold and is a strong product line. The Rocketdyne COIL technology that lost out on ABL is currently being demonstrated for tactical applications in ground vehicles. A demonstration on a C-130 aircraft is also planned.

Engineering Services

The Air Force laboratory in New Mexico that headed the AF research into HEL decided to outsource the operation of their in house laboratory work and encouraged Rocketdyne to bid. Rocketdyne formed a subsidiary named Rockwell Power Systems (RPS) and won the contract. A few years later, RPS won the contract to operate the Maui Space Surveillance System (MSSS), the complex of telescopes on Mount Haleakela that supports both the AF Space Command and AF HEL experiments. The MSSS observes and catalogs all objects in Earth orbit. MSSS also supports the Planetary Defense program by visually surveying asteroids and comets that could pose a threat to Earth. For the MSSS program, RPS helped develop a supercomputing center and technology campus on Maui, and managed a major expansion of the Haleakela facilities. Senator Inouye praised Rockwell for furthering his goal of bringing high technology business and jobs to Hawaii. This business remains with Boeing.

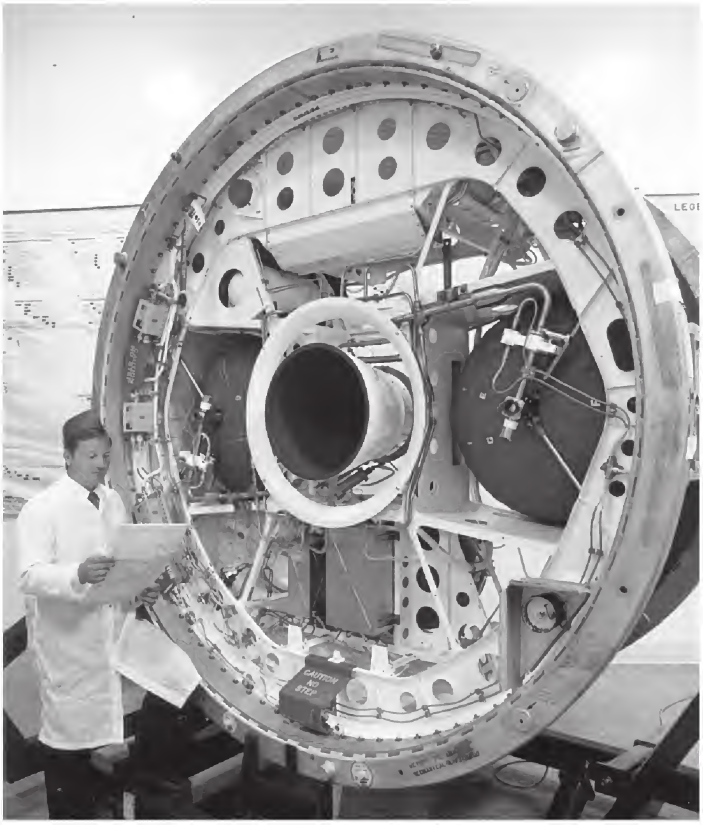
Missile Stages and Kill Vehicles

Rocketdyne was forever trying to move up into making more of a system than just the rocket engine. Rocketdyne built and tested a prototype upper stage for NASA called the Nomad but the fluorine and hydrazine propellants were considered too hazardous and NASA decided to use the oxygen and hydrogen Centaur instead. Rocketdyne next led studies for the Air Force of a space stage that used fluorine and hydrogen propellants with the company's innovative aerospike engine. An unexplained liquid fluorine tank explosion at our Reno test facility ended the program.

Rocketdyne had built the engine for the Minuteman ICBM top stage and other NAA/Rockwell divisions had built major parts like the structure. When the much larger Peacekeeper missile (initially titled MX) development was announced, Rocketdyne formed an all Rockwell team for the upper stage. Because of the number of warheads and the accuracy requirements, the upper stage had to be capable of complex maneuvers (what one engineer termed doing a dance in space). Rocketdyne developed and manufactured the Peacekeeper Stage IV. Rocketdyne integrated the stage, built all the rocket engines and installed the separately contracted Autonetics guidance package. Columbus division built the structure. The accuracy of warhead placement was virtually perfect.



The Maui Space Surveillance System



Peacekeeper Post-Boost Propulsion System (RS-34)

Having finally built an entire large missile stage, Rocketdyne transitioned to working on miniature kinetic kill vehicles (MKV) to intercept ICBMs. The typical MKV is a cluster of tiny pulsing rocket thrusters with a guidance package strapped on. Tests of prototype MKV were done in a hanger at Edwards AFB. The lateral thrusters were used to hover the MKV while the controls and guidance were tested. In one test series, a target emulating the thermal signature of a warhead re-entering the atmosphere was set up in the desert and the hanger doors were opened so the guidance acquisition and tracking could be tested. The axial thrust was supposed to be disabled so the MKV would just hover within the hanger. There was a minor panic when the MKV instead of locking onto the test target started tracking the tailpipe of a pickup truck leaving the facility. The level of panic increased when the axial thruster fired and the MKV headed toward the hanger doors to intercept the pickup. Luckily the tether on the MKV and the netting across the open doors held.

The missile interceptor market was another area in which different teams at Rocketdyne fell into competition with each other. A prime use for the Airborne Laser is missile interception in direct competition with the MKV approach. The spinoff of Rocketdyne by Boeing finally ended that close internal rivalry since the HEL effort remained with Boeing.

Sound Generating Systems

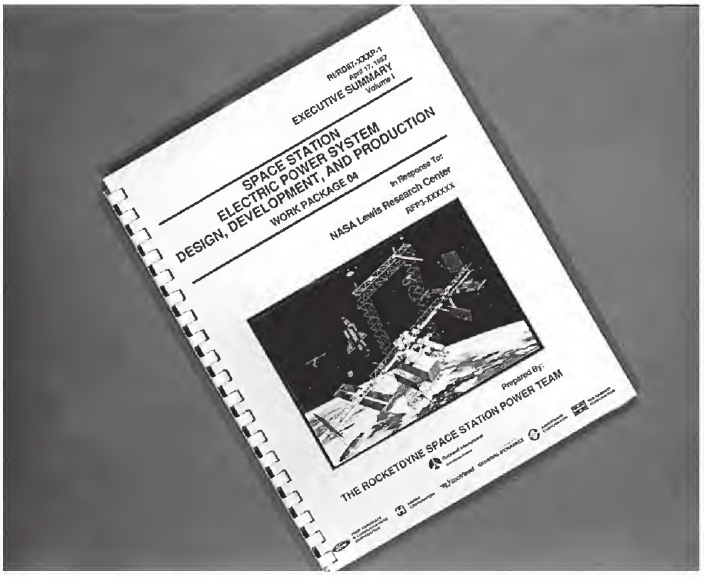
An early concept for KV propulsion was a pulsed piston engine that gave out short powerful pulses of gas. The shock and sound of the engine were enormous. When it appeared too heavy for miniature kill vehicles we looked for other applications. One idea that was tried was a replacement for explosive charges in using sound pulses to profile geologic formations. Another was for underwater use to send out huge sound pulses in the event of war to completely map the position of all submarines using the sonar echo of the pulses in conjunction with the in place passive listening system. We convinced Autonetics Marine Systems to let us use their test pool for initial underwater testing. The test was successful but cracked the thick cement of the pool so that it leaked. We persevered through actual sea trials.

Electrical Power System

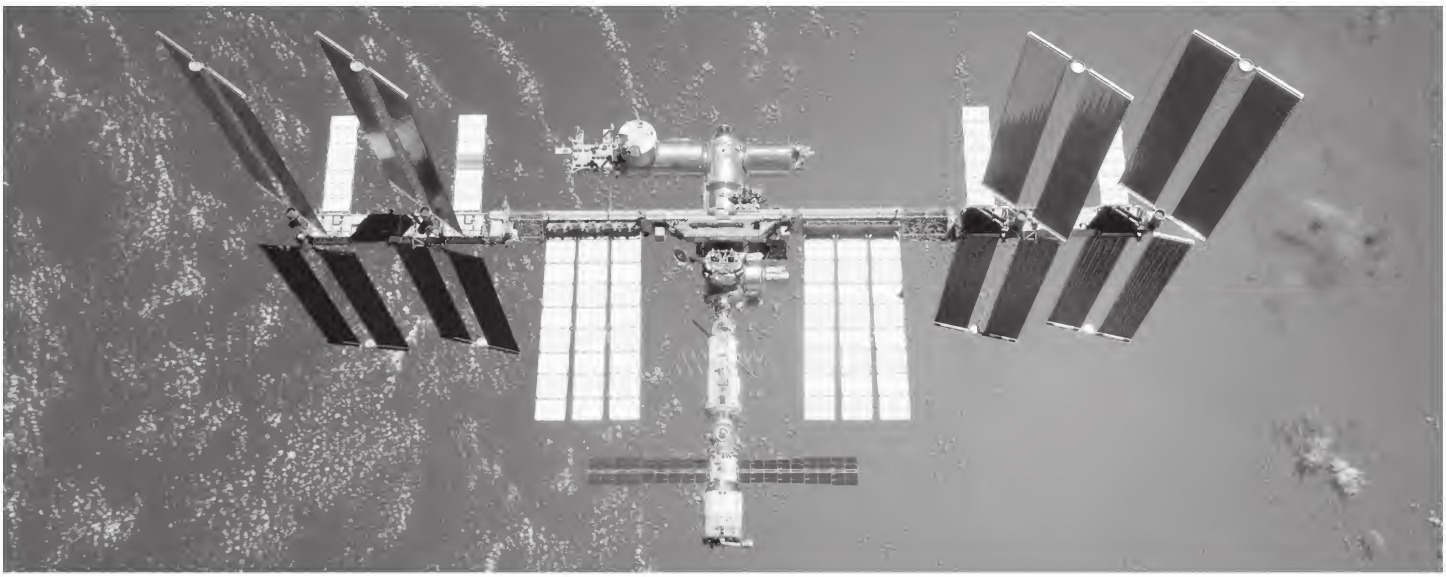
The International Space Station (ISS) program was initiated at the same time that Rockwell disbanded the Energy System Group, transferring the head of the group to lead the B-1B program. The Atomics International (AI) part of ESG was folded into Rocketdyne. Because of internal NASA politics, the ISS program was divided into Work Packages (WP). We were involved in R&D contracts to develop propulsion technology for the ISS. However, propulsion was only a small piece of a WP and we would have to find a prime contractor who wanted our support. We had also been looking at ways to be involved in the power system based on our work on Solar 1. With the addition of the AI capabilities and the announcement that power would be a separate WP we were suddenly positioned to win a very major contract for the ISS.

In the initial conceptual phase, NASA wanted to consider all types of power. We were the only one of the competitors with strong credentials in all types. AI had sound credentials in space nuclear power. Both divisions had strong solar dynamic power (focusing the sun onto a receiver to heat a fluid and drive a turbine) experience. Experts in photovoltaic (PV) power were borrowed from Satellite Systems Division. We brought in strong team members like Lockheed-Martin for PV solar panels, Garrett and Sundstrand for solar dynamic power cycles and Harris for space structures. In the initial phase, both Rocketdyne and TRW received contracts. In the down select for the development and production, Rocketdyne beat out the very formidable TRW because of the depth and breadth of our effort.

A critical area of the ISS electrical power system is the Power Management and Distribution (PMAD) system. This system takes the power generated in the PV solar cells and distributes it throughout the station. The power levels are an order of magnitude higher than any previous space system. The energy input is variable, requiring storage capacity. The loads are highly variable



The Space Station Power Proposal



NASA photo

The Space Station in orbit showing the Rocketdyne developed solar sails and rotating joints

and unpredictable because of the wide range of possible experiments that could be installed over the life of the ISS. A variety of voltages are required. Most importantly, the ISS cannot tolerate brownouts or blackouts. No matter what may happen in an individual experiment, the station systems and other experiments must be protected. At the height of the development effort, Rocketdyne had the largest group of power management experts ever assembled developing systems, hardware and software to solve this difficult problem.

Rocketdyne tried to capitalize on our advances in PMAD by marketing our capabilities to aircraft manufacturers (military and commercial), the Navy and Army. We found that we were several generations too early on the development cycle for such a sophisticated approach. Despite our inability to extend our ISS technology to other applications, the ISS power system remained a major program for Rocketdyne and now Boeing. The final set of solar panels was installed this year, twenty-five years after we won the first proposal.

Hypersonic Propulsion

When the National Aerospace Plane (NASP) program was announced, Rocketdyne found that we already had many of the requisite technologies for the NASP engines such as cooling, high temperature materials, computational fluid dynamics, combustion, propellant control and supply and overall engine system integration. Through hiring we added experts in hypersonic inlets and combustion. In earlier programs we had looked at concepts like the liquefied air cycle and rocket based combined cycle. We were able to win one of the two engine R&D contracts. Pratt & Whitney won the parallel contract.

Through a fierce competitive phase we developed and analyzed concepts, developed new materials, built and wind tunnel tested sub scale test engines and worked with the airframe competitors on vehicle-engine integration. After the proposals for the next phase were submitted, the Government NASP program office announced that they wanted to form a national team made up of all of the competitors to keep all of the nation's expertise in the program. Since Rockwell had bid on both vehicle and engine, Rockwell was picked to lead the national team. Rocketdyne's program manager was elevated to Rockwell corporate level and assigned as program manager of the national team.

Although the NASP program was eventually cancelled because it was too great a stretch from the state of the technology to a full-scale flight vehicle, the technology advances were significant and are starting to show promise on current R&D contracts. In particular, a Boeing-Pratt & Whitney-Rocketdyne team is successfully flying small hypersonic test vehicles. The vehicles use the wave rider concept originally developed on the NAA B-70. The engine combines elements of both P&W and Rocketdyne NASP engines and the vehicles use technology from the Rockwell NASP concept. The unmanned vehicles are carried to altitude and dropped from a mother plane based at Edwards AFB like the manned NAA X-15.

About the Author: Steve graduated from MIT with degrees in Physics (1963) and Nuclear Engineering (1965) and the UCLA Engineering Executive Program (1972). In 1965 he joined the Rocketdyne Advanced Programs department, headed at that time by Sam Iacobellis. Steve says that working for Sam and the Advanced Programs management team was like taking a post-doctoral degree in marketing and writing winning proposals. After working on various proposals and conceptual studies, Steve was assigned to lead the key Engine Performance section of the Space Shuttle Main Engine (SSME) proposal. Following the SSME win, he authored the industry standard manuals on rocket engine performance. He was assigned to the team that started the high-energy laser business area. In lasers he held business development and program management positions. Steve returned to propulsion as business development director. While holding various program management and director positions in advanced propulsion, he was also the Technical Volume leader for the initial Space Station Electrical Power System proposal. He was proposal manager for the National Aerospace Plane Engine proposal and for the Maui Space Surveillance System proposal. Steve retired in 1997 as Director of Advanced Technology Programs and Proposal Operations. Technologies developed under his direction are flying in the current generation of rocket engines. He currently resides with his charming wife, Sheila, in Foothill Ranch, California.

Ferrying Shuttle Atlantis *Home*

by Jack "Triple" Nickel

Well, it's been 48 hours since I landed the 747 with the shuttle *Atlantis* on top and I am still buzzing from the experience. I have to say that my whole mind, body and soul went into the professional mode just before engine start in Mississippi, and stayed there, where it all needed to be, until well after the flight…in fact, I am not sure if it is all back to normal as I type this e-mail. The experience was surreal. Seeing that "thing" on top of an already overly huge aircraft boggles my mind. The whole mission from takeoff to engine shutdown was unlike anything I had ever done. It was like a dream…someone else's dream.

We took off from Columbus AFB on their 12,000 foot runway, of which I used 11,999 1/2 feet to get the wheels off the ground. We were at 3,500 feet left to go of the runway with throttles full power, nose wheels still hugging the ground, copilot calling out decision speeds, the weight of Atlantis now screaming through my fingers clinched tightly on the controls, tires heating up to their near maximum temperature from the speed and the weight, and not yet at rotation speed, the speed at which I would be pulling on the controls to get the nose to rise. I just could not wait, and I mean I COULD NOT WAIT, and started pulling early. If I had waited until rotation speed, we would not have rotated enough to get airborne by the end of the runway. So I pulled on the controls early and started our rotation to the takeoff attitude. The wheels finally lifted off as we passed over the stripe marking the end of the runway and my next hurdle (physically) was a line of trees 1,000 feet off the departure end of Runway 16.

All I knew was that we were flying and so I directed the gear to be retracted and the flaps to be moved from Flaps 20 to Flaps 10 as I pulled even harder on the controls. I must say, those trees were beginning to look a lot like those brushes in the drive through car washes so I pulled yet even harder! I think I saw a bird just fold its wings and fall out of a tree as if to say "Oh just take me". Okay, we cleared the trees, "duh", but it was way too close for my laundry. As we started to actually climb, at only 100 feet per minute, I smelled something that reminded me of touring the Heineken Brewery in Europe…I said, "Is that a skunk I smell?" and the veterans of shuttle carrying looked at me, smiled and said, "Tires!" I replied, "TIRES??? OURS???" They smiled and shook their heads as if to call their Captain an amateur…okay, at that point I was. The tires were so hot you could smell them in the cockpit. My mind could not get over that, from this point on, this was something I had never experienced. Where's your mom when you REALLY need her?

The flight down to Florida was an eternity. We cruised at 250 knots indicated, giving us about 315 knots of ground speed at 15,000 feet. The miles didn't click by like I am used to them clicking by in a fighter jet at MACH 0.94. We were burning fuel at a rate of 40,000 pounds per hour or 130 pounds per mile, or one gallon every length of the fuselage. The vibration in the cockpit was mild, compared to down below and to the rear of the fuselage where it reminded me of that football game I had as a child where you turned it on and the players vibrated around the board. I felt as if I had plastic clips on my boots, I could have vibrated to any spot in the fuselage I wanted to go without moving my legs…and the noise was deafening. The



NASA Photo by Jack Pfaller

NASA 911, the Shuttle Carrier Aircraft (SCA) and its piggyback passenger space shuttle* Atlantis *approach Kennedy Space Center's Shuttle Landing Facility on June 2, 2009 after a two-day trip from California. The SCA is a modified Boeing 747 jetliner.

747 flies with its nose 5 degrees up in the air to stay level, and when you bank, it feels like the shuttle is trying to say, "Hey, let's roll completely over on our back"…not a good thing I kept telling myself. So I limited my bank angle to 15 degrees and even though a 180 degree course change took a full zip code to complete, it was the safe way to turn this monster.

Airliners and even a flight of two F-16s deviated from their flight plans to catch a glimpse of us along the way. We dodged what was in reality very few clouds and storms, despite what everyone thought, and arrived in Florida with an excess of 51,000 pounds of fuel too much to land with. We can't land heavier than 600,000 pounds total weight and so we had to do something with that fuel. I had an idea…let's fly low and slow and show this beast off to all the taxpayers in Florida lucky enough to be outside on that Tuesday afternoon.

So at Ormond Beach we let down to 1,000 feet above the ground/water and flew just east of the beach out over the water. Then, once we reached the NASA airspace of the Kennedy Space Center, we cut over to the Banana/Indian Rivers and flew down the middle of them to show the people of Titusville, Port St. Johns and Melbourne just what a 747 with a shuttle on top looked like. We stayed at 1,000 feet and since we were dragging our flaps at "Flaps 5", our speed was down to around 190 to 210 knots. We could see traffic stopping in the middle of roads to take a look. We heard later that a Little League Baseball game stopped to look and everyone cheered as we became their 7th inning stretch. Oh say can you see…

After reaching Vero Beach, we turned north to follow the coastline back up to the Shuttle Landing Facility (SLF). There was not one person laying on the beach…they were all standing and waving! "What a sight" I thought…and figured they were thinking the same thing. All this time I was bugging the engineers, all three of them, to re-compute our fuel and tell me when it was time to land. They kept saying, "Not yet Triple, keep showing this thing off" which was not a bad thing to be



NASA Photo by Jack Pfaller

The Shuttle Carrier Aircraft and Space Shuttle* Atlantis *lands on NASA Kennedy Space Center's Shuttle Landing Facility runway 15 in Florida.* Atlantis *returned from California atop the SCA after its May 24 landing at Edwards Air Force Base, concluding mission STS-125.

doing. However, all this time the thought that the landing... the muscling of this 600,000 pound beast…was getting closer and closer to my reality. I was pumped up! We got back to the SLF and were still 10,000 pounds too heavy to land so I said I was going to do a low approach over the SLF going the opposite direction of landing traffic that day. At 300 feet, we flew down the runway, rocking our wings like a whale rolling on its side to say "hello" to the people looking on! One turn out of traffic and back to the runway to land…still 3,000 pounds over gross weight limit. But the engineers agreed that if the landing were smooth, there would be no problem. "Oh! Thanks guys, a little extra pressure is just what I needed!" So we landed at 603,000 pounds and very smoothly if I have to say so myself. The landing was so totally controlled and on speed, that it was fun. There were a few surprises that I dealt with, like the 747 falls like a rock with the orbiter on it if you pull the throttles off at the "normal" point in a landing and, secondly, if you thought you could hold the nose off the ground after the mains touch down, think again…IT IS COMING DOWN!!!



NASA Photo by Jack Pfaller

Against a setting sun, Space Shuttle* Atlantis *and the Shuttle Carrier Aircraft, are towed toward the mate/demate device on the Shuttle Landing Facility.

So I "flew it down" to the ground and saved what I have seen in videos of a nose slap after landing. Then I turned on my phone after coming to a full stop only to find 50 bazillion e-mails and phone messages from all of you who were so super to be watching and cheering us on! What a treat, I can't thank y'all enough. For those who watched, you wondered why we sat there so long. Well, the shuttle had very hazardous chemicals on board and we had to be "sniffed" to determine if any had leaked or were leaking. They checked for Monomethylhydrazine (N_2H_4) and nitrogen tetroxide (N_2O_4). Even though we were "clean", it took way too long for them to tow us in to the Mate-Demate area. Sorry for those who stuck it out and even waited until we exited the jet.

I am sure I will wake up in the middle of the night here soon, screaming and standing straight up dripping wet with sweat from the realization of what had happened. It was a thrill of a lifetime. Again I want to thank everyone for your interest and support. It felt good to bring *Atlantis* home in one piece after she worked so hard getting to the Hubble Space Telescope and back.

Jack "Triple" Nickel
NASA Pilot

About the Author: Jack served for 25 years as a USAF fighter pilot, combat ready in the F-4, F-5E, F-15, and F-16 with Squadron Commander and Wing Commander assignments. With NASA, he has flown all the aircraft in NASA's inventory. Although, there is little chance that he will be involved with an NAA airplane, we hope that in the future, he will honor us with an article directly!

Letter of Appreciation

DEPARTMENT OF THE AIR FORCE
USAF ACADEMY PREPARATORY SCHOOL
USAF ACADEMY, COLORADO

1 Jul 2009

Colonel Todd M. Zachary
Commander
5220 Cedar Drive, Suite 117
USAF Academy, CO 80840

Mr. Edmund J. Rusinek
Bald Eagles, Inc. Bulletin
11291 Wembley Road
Rossmoor CA 90720-2925

Dear Mr. Rusinek

On behalf of the Prep School, I would like to thank you and the North American Aviation Retirees for your generous donation to the Preparatory School. Your gift of $4000 will be used to fund the Outstanding Preparatory School Graduate award. This award is given to the graduate that demonstrates excellence in academics, athletics and military studies at the commencement exercise each May. Although this award has been given in years past, a new design is planned to include the North American Aviation name and logo.

We are honored to help carry on the name of North American Aviation. Once again, my heartfelt thanks for your generosity to the Preparatory School.

Sincerely

TODD M. ZACHARY, Col, USAF

Opportunity...Preparation...Motivation  *Success*

Contrails From The Past

by Ed Rusinek

Dear Ed,

The accidental dropping of the X-10 during the unloading at Edwards (Summer Issue) brought back a memory of the Air Force attempt to lift the restored X-15A-2 for a test of the external tanks separation system prior to the June 25, 1964 planned flight test (Flt No. 2-32-55 by X-15 Test Pilot Robert A. Rushworth).

NASA thought it would be advisable to lift the aircraft (by its attachment connections) and have the empty tanks ejected from a height of about 10-15 feet to verify that the system functioned as designed. Bill Allbright (NASA), Jerry Brandt (USAF), myself and about a dozen others were on hand to witness the test, including a NASA film crew.

The USAF dug a large pit out at the edge of the lake bed and lined it with a great amount of loose soft-foam chunks. The pit itself was about 25 feet or so in diameter and 10-15 feet deep. The X-15A-2 was pulled over to the edge of the pit and we awaited the USAF to deliver the lifting vehicle. What they brought was an enormous rickety old forklift! I had no idea that they made something so large! Its rated capacity at full extension was several times the mass of the aircraft. However, I questioned that capability, since both fork-arm attachments were broken completely through, and severely bent. Bill took a look at the unit and ordered it to be returned (his words were harsher); and that they get a crane, the largest they have.

About an hour later this huge crane was seen lumbering very slowly along the lake bed towards the test site. This same operator brought the crane up to the edge of the aircraft and proceeded to lower the attachment cables, but we pointed out to him he was too close, and the aircraft wings would strike the crane. The operator backed the unit up and the cables were attached. He was ready to lift the aircraft, when we noticed he had failed to extend his outrigger arms into the soft soil surrounding the site! We ordered him to stop the lift and fully extend the arms, a task he was plainly against doing, stating that the crane needed no stabilization, as the weight he was lifting didn't amount to a hill of beans. Our main concern was the effect that the ejection might have on the suspended center of gravity, and that it might cause the aircraft to 'bounce' about and sway, or that the crane might tip over and we'd lose the aircraft! The operator reluctantly complied after we pointed out to him that if the aircraft is damaged, he'd be the one responsible!

The ejection tests went off without a hitch. Personally, Jerry and I thought that this was a silly test, as it didn't seem to truly verify anything, excepting that the switching systems functioned. Each tank was ejected separately for confirmation of their respective release system. They ejected so quickly that our eyes couldn't follow their downward trajectory into the pile of foam. I was surprised to see that there was no damage to the tank.

—Cleve Kimmel, Billings, MT

Ed's Ans.: How often do we have to learn that not following established procedures, especially safety procedures, costs us time, material and, sometimes, lives.

Dear Ed,

I thoroughly enjoyed the Mustang story by Lowell Ford in the Summer Issue. Please forward my thanks to him for his outstanding article.

I also want to thank you volunteers for publishing such a great bulletin for the benefit of the retirees who can look back with a bit of nostalgia at the achievements that were accomplished by them through their unselfish cooperative efforts.

Enclosed is a check for $100.00 to add to the NAA Scholarship Fund.

—Rolf Schmued, Los Angeles, CA

Ed's Ans.: In part, the P-51 story is a part of your father's story. Coming from an era where airplanes were built of wood, wire, glue and canvas; Edgar Schmued, armed only with a sliderule, was a brilliant designer of the P-51. He was also a gentleman and a gentle man. Thank you for the check, Rolf. It will help pay some additional costs related with the USAF Academy Scholarship Awards.

Dear Ed,

Lowell Ford's article on the Mustang was a real winner. It's hard to imagine the amount of research it must have taken to dig up all those long forgotten nuggets of information about the Mustang origins and all the other early NAA fighter projects. As a P-51 buff from way back, I really appreciated his efforts and hope to hear from Lowell again in the near future.

—Chuck Smeton, Issaquah, WA

Ed's Ans.: The article is part of the P-51 book that Lowell is preparing for publication. The book should be the final word on the P-51. However, rest assured that Lowell will be back in the Bulletin with more splendid reports.

Dear Ed,

I really enjoy your Retirees Bulletin. I work in the AF Museum Archive Section and I always cut out the various articles and put them in the appropriate places in our files. The information in your articles is usually not available from other sources.

—Richard Meixell, Dayton, OH

Ed's Ans.: Thank you Mr. Meixell, for your kind words. We pride ourselves on our authors because many have experienced what they write about and they write from the heart!

Dear Ed,

Your account of the development of the P-51 starting in the Preliminary Design Group at NAA is a Gem.

I joined NAA in 1936 as a draftsman, and was assigned to the Group in 1938 as a draftsman for studies of the cockpit arrangement. I would like to comment on the absence of Ed Schmued's signature on the drawings that came out of the Group and were turned over to the Design Group for layout and detail design. It was normal practice then to have the drawings signed or initialed in the title block by

the draftsman, the checker, the stress analyst and sometimes the material and process engineer. The Preliminary Design engineer was not included which accounts for the lack of Ed Schmued's signature. This was not intended as a slight or disregard of his contribution and, in fact, his name was well recognized as that of a talented airplane "conceptual designer".

What came out from the Preliminary Design Group was a general arrangement and it was left to dozens, sometimes hundreds, of draftsmen to prepare detail drawings that were then checked, analyzed for strength and minimum weight and then reviewed by the systems engineers for function and reliability.

So give credit to Ed Schmued. His story has never really been told because conceptual designers are not considered glamorous enough, but it should be. Thank you Lowell for a great story.

—Les Hall, Encino, CA

Ed's Ans.: I love to hear from folks like you that are younger than life! Great recall of the events and people that made things happen! I thank you, Lowell thanks you, and Rolf Schmued thanks you. God Bless.

Dear Ed,

The X-10 article in the Summer Issue brought back many memories since I worked on test models at NACA, Langley Field in the late 1940s and came to NAA in 1951 and was assigned to Edwards AFB as a Reliability Specialist on the X-10. Later, I was assigned to Cape Canaveral in Florida as head of Reliability on the Navaho G-26. I returned to California in 1957 to work at Rocketdyne at Santa Susana and then on Apollo, B-1A, Space Shuttle, and then back to B-1B. After a fantastic 31 year career with the greatest company ever, I retired in 1984.

—Bill Daugherty, Corona, CA

Ed's Ans.: I served with you on Apollo but I never knew of all the fantastic programs that you worked on. Good show!

Dear Ed,

I want to thank all of you for your continuing effort in publishing the Retirees Bulletin. I enjoy it immensely.

—Glenn Patton, Santa Ana, CA

Ed's Ans.: Thank you for your kind words and your kind donation. Both are appreciated!

40th Anniversary of Apollo 11 – Kennedy Space Center, July 16, 2009





Standing (L-R): Jim Moegling, Ron Tulino, Hal Bucher, Connie Perez, Marty Cioffoletti, Joel Robinson, Ken Owen, and George Hofmann. Front, kneeling: Carl Robb, John Tribe, and Larry Whitacre.

Congratulations and Best Wishes to

Harold and Betty Hayes of Central Point, Oregon celebrating their 65th Wedding Anniversary

David and Eileen Herold of San Marcos, California celebrating their 62nd Wedding Anniversary

William and Barbara Mitchell of Long Beach, California celebrating their 60th Wedding Anniversary

Stanley and Laura Williams of El Segundo, California celebrating their 59th Wedding Anniversary

John and Vivian Andres of Seymour, Tennessee celebrating their 56th Wedding Anniversary

The Silent Majority

by Stan Guzy

ALTNEU, IRWIN J. 81 – of La Mirada, CA passed away on August 22, 2009 after losing his battle with liver cancer. Irwin retired from Space Division in 1986 after 35 years of service. He is survived by his wife of 58 years, Shirley.

ASHLEY, GEORGE E., – of Fullerton, CA passed away on April 25, 2009 after a short illness. George retired from LAD in 1970 after 32 years of service. He is survived by his daughter Laura Cahill.

BANNARD, RAYMOND O., 93 – died in Toney, AL on June 23, 2009. Ray retired from LA/Palmdale in 1976 after 37 years of service. He is survived by his loving wife Nora, also a LA/Palmdale retiree.

BECKINGTON, ARTHUR R., 86 – passed away in Fallbrook, CA on May 5, 2009. With an MS degree in Aerospace Engineering from MIT, Art served on several aerospace projects for over 40 years service before retiring. He is survived by his wife, Hazel.

BENTLEY, JACK, JR., – of Placentia, CA. Bulletin returned stamped "Deceased". Jack retired from the Seal Beach facility in 1983 with 27 years of service.

BOLTINGHOUSE, JOSEPH C., 89 – succumbed to a heart attack on July 29, 2009 in Whittier, CA. Joe retired from the Autonetics Marine Systems Division in 1988 with 37 years of service. He attained 12 patents for gyroscope design. His invention of the solid beryllium rotor for the ESG using the modulation of capacitance, used in the Navy's Trident I and Poseidon ESG Monitors, earned him one of the top ten NAA/RI Engineer of the Year Awards in 1976. He was the 1974 recipient of the Thomas L. Thurlow award for his outstanding contribution to the science of navigation. Additional accomplishments included work on the Stable Platform and Free Rotor Gyroscope. He was a top scientific mind in the technology of inertial navigation. Joe is survived by his loving wife of 54 years, Helen.

BUCKNER, ARNOLD A. "BUCK", 78 – succumbed in Vacaville, CA on May 30, 2009. Buck started at LAD in 1955 as a precision grinder, retiring in 1985 as a manufacturing engineer. He served on the B-1A and B-1B and at Rocketdyne on the Space Shuttle Main Engines.

COONTZ, LELAND I., JR., 74 – passed away on June 9, 2009 in Orange, CA. He served on several NAA aerospace projects. After retirement, he joined the Northrop Corp. as a research engineer, retiring for a second time in 1994. He was recognized for his creative technology and aerospace business strategies, including nine patented technical inventions.

DIDONNA, ANTHONY "TONY", 72 – passed away after suffering a stroke on May 22, 2009. Tony joined NAA/RI after serving in the Navy. He retired as a manufacturing manager after a successful 35-year career. He is survived by his wife, Mary.

DUNGER, JAMES E., 73 – Jim passed away suddenly on June 9, 2009 while winning his weekly game of pool from his close friends in Lincoln, CA. He served as an aerospace engineer at NAA/RI until he became an attorney in 1976, specializing in business and real estate matters. Jim will be sorely missed by his wife of 52 years, Marilyn.

EDWARDS, RICHARD P. "DICK", 75 – passed away suddenly on June 3, 2009 while at the tiller of his sailboat and in the lead in the Wednesday Night Sailboat Race on Clear Lake in Houston, TX. Dick served on the Saturn and Space Shuttle programs in Downey and was transferred to Houston in 2002 where he continued to work on the Space Shuttle. He helped establish the California State Science Fair and cofounded the Space Settlement Design Competition which involved over a 1,000 high school students annually worldwide. He is survived by his loving wife of 23 years, Anita Gale.

EVANS, RICHARD D. "RICK", 73 – of Palos Verdes, CA died on March 12, 2009 as a result of complications from a stroke. Rick served in Engineering on the B-1 and later in Program Control on the GPS program. Rick was a second-generation NAA employee. He is survived by his wife Susan.

FLYNN, RAYMOND H., 86 – of Anaheim, CA died of Alzheimer's disease on May 14, 2009. A Lt. Commander, JAG, during WWII, Ray joined Rockwell as a contract administrator at Space, Autonetics, and Corporate. He is survived by his wife, Betty.

GARCIA, PAUL A., 81 – of Corona, CA, passed away on May 14, 2009. Paul joined NAA at Downey in 1948 as an electronics engineer. His 40 years of service included assignments on the Apollo and Space Shuttle programs developing and supporting flight control system test and operations. He was preceded in death by his loving wife of 60 years, Eloise.

GIBSON, W. FREDERICK "HOOT", JR., 81 – succumbed to pneumonia in Long Beach, CA on May 27, 2009. A proud Texan from Texas A&M, Fred joined the Stress Group at Downey in 1951where he quickly acquired the nickname "Hoot" after the famous cowboy actor. He was a dedicated and capable stress engineer on all NAA/Rockwell space programs for 35 years until he retired in 1986. Fred is survived by his loving wife Mary.

GRISWOLD, RICHARD C., 69 – died on April 8, 2009 in Warner Robins, GA. He retired from B-1B Field Service in 1999 after 33 years of service. He is survived by his daughter Diane.

HEPWORTH, GEORGE W., 88 – passed away in Magalia, CA on May 16, 2009 after a lengthy illness. George retired from LAD in 1977 after 36 years of service. His passing was reported by his sister Pat Scott, another NAA retiree with 40 years of service.

HERZOG, MAXINE, 80 – of Lakewood, CA, passed away in Long Beach Memorial Hospital on June 8, 2009 after a recurring battle with cancer. A single parent, she started in Downey in Manufacturing where she was responsible for assembling wiring bundles for the Apollo and Space Shuttle vehicles. Maxine retired in 1995 with over 40 years of service. She is survived by her son, Kenneth, and daughter, Denise. She was a hard working lady with an undauntable spirit. She will be dearly missed by her family and friends.

HOLT, MILLARD R. "JACK", 88 – passed away in Riverside, CA on June 26, 2009. Jack retired from the U.S. Air Force in 1961 as a Chief Master Sergeant. In 1986, he retired from Space Division. Interment will be at Arlington National Cemetery.

HOLES, CHARLES E., 92 – of Lynden, WA, died on January 9, 2009 of a heart attack. Charles retired from LAD in 1977 after 29 years of service at Space Division and LAD.

HUNTER, JOHN W., 91 – of Sun City, CA, died on June 13, 2009 of natural causes. John started at LAD in 1941on the B-25 program. He later transferred to Space Division on the Apollo project. He retired in 1978 as a Manufacturing supervisor with 37 years of service. He is survived by his loving wife of 68 years, Winifred.

JACKSON, MARY JANE, 87 – passed away on May 31, 2009 from pancreatic cancer. In WWII, Mary enlisted in the U.S. Navy WAVES and served in the Reserves. She retired from NAA/RI in 1990.

JOHNSON, MAL, 86 – died on June 19, 2009. He had been ill for quite some time before his demise. Mal worked at the Autonetics facility for over 38 years and retired in 1987.

MILLER, MICHEL "MIKE", – of Walnut, CA. Bulletin returned stamped "Deceased". Michel retired in 1985 after 17 years of service on the B-1 at LAD and at Space Division.

MUNSEY, EDWARD H., 87 – of Fountain Valley, CA, died on April 26, 2009. Ed retired from Downey in 1993 after 29 years of service including a stint in Shuttle Integration. He is survived by his loving wife of 52 years, Edith

NESTOR, JOHN J. "JAY", 77 – passed away peacefully at home in Tustin, CA surrounded by his family after a courageous fight against cancer. Jay instructed foreign air force pilots in the field for many years as an Autonetics Technical Representative. He and his wife eventually settled in Tustin, CA in 1968. He continued with Autonetics until he retired from NAA/RI/Boeing after 40 years of service and continued "old school" consultations with Boeing until early 2009. He is survived by his wife Carolyn.

NORTHWAY, JERRY – of Gardnerville, NV. Bulletin returned stamped "Deceased". Jerry retired from LAD in 1991 with 11 years of service.

O'KELLEY, BRUCE E., 81 – passed away in Cushing OK on June 12, 2009. Bruce retired from the B-1 program at Palmdale in 1987 after 26 years of service as an engineer. He is survived by his wife Jerry.

OLSEN, BURTON R., 88 – died peacefully on July 3, 2009 in Placentia, CA after a short battle with mesothelloma lung cancer. Burton retired from NAA/RI as a Quality Control inspector after 38 years of commendable service. He was preceded in death by wives, Patricia and Edith.

PARTRIDGE, (McCUNE), ARDYS A., 93 – passed away on July 7, 2009 from undisclosed causes. Ardys' service for 27 years as an associate manufacturing engineer included the Apollo Project. She is survived by Roland, her husband of 29 years.

ROBINSON, AUDREY L., 87 – of Richardson, TX died on June 23, 2009. Audrey was a secretary at the executive level on the B-1 program. She had 15 years of service when she retired in 1984. Her late husband, Lawrence, was a model design engineer at NAA and both were very dedicated in their service to the company.

SCHORMANN, KATRINA "KATHY", 76 – passed away peacefully at her home in Mineola, NY on March 12, 2009. A graduate of the University of Miami, Kathy joined NAA/Rockwell as an electrical engineer on the Apollo program and served on several other programs. She is survived by her brother George.

STOLLER, CLEMMONS W., 80 – passed away on July 28, 2009 in Riverside, CA. Clem joined NAA after service with the Navy in the Korean War. He worked in the Calibration Lab on the Apollo program and then transferred to Autonetics where he maintained the ovens used to make integrated circuits. Internment was at the Riverside National Cemetery.

WEINER, G. DOUGLAS, 82 – was reported to have died on March 8, 2009 from complications resulting from Alzheimer's disease. He served for over 30 years as a Facilities specialist on new construction for Corporate Offices. He is survived by his wife Eileen.

WINTER, DANIEL L., 83 – passed away on December 22, 2008 in Torrance, CA. Dan retired from the LA Division in 1986 after 20 years of service.



PAX DOMINI SIT SEMPER VOBISCUM

IN PASSING

It is always amazing how little family members know about what their deceased Mom or Dad did for so many years to provide food, clothing, shelter, and perhaps, even a college degree. One daughter called us and didn't even know which "airplane" company employed her father. It is true that many of us worked on classified programs but that was decades ago. Do your family a favor and jot down on a 3x5 card what Divisions you were with, Programs you supported, Tasks you performed, Years of Service, and the Year you retired. Remember! Whether you were a vice president or a janitor, you are NAA family and we love you for your service!

NORTH AMERICAN AVIATION
RETIREES BULLETIN
P.O. Box 3797
Seal Beach, CA 90740

North American Aviation Retirees Bulletin

"WHERE THE BEST NEVER REST"

FIRST CLASS
U.S. POSTAGE
PAID
LONG BEACH, CA
PERMIT No. 70002



NASA Photo by Tom Tschida

NASA 911, a Boeing 747 modified to carry the space shuttles, lifts off Runway 22 at Edwards Air Force Base carrying the shuttle* Atlantis *on its back on the first leg of* Atlantis' *ferry flight back to the Kennedy Space Center in Florida.

NORTH AMERICAN AVIATION
Retirees Bulletin
"Where The Best Never Rest"

Winter 2009

Inside:

MUSTANGS OVER JAPAN by John Lambert

SAVING SKYLAB by Jack Potts

NAA AT CAPE CANAVERAL AND KSC – PART I by Bill Edson



At 12:45 P.M., on November 8, 1944, 1st Lt. Edward R. Haydon, flying his P-51D **"Lady Nelda"** *of the 357th Fighter Group, joined P-51s of the 20th Fighter Group in the chase of a crippled Me 262 towards its airfield at Achmer, Germany. The Luftwaffe fighter pilot, famous ace Major Walter Nowotny, dragged his pursuers into a barrage of flak put up by the airfield defenses. All 20th Fighter Group P-51s broke right. Lt. Haydon broke to the left only to find the Me 262 on the downward leg for landing. As Haydon continued his turn towards firing position, the German pilot caught sight of him and reacted violently, snapping inverted and diving into the ground right under the P-51's nose. Haydon had not fired a shot! The moment is captured by famous Aviation Artist Keith Ferris in his painting* **"Nowotny's Final Encounter".**

NORTH AMERICAN AVIATION
Retirees Bulletin

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Dear NAA Retirees Bulletin Subscriber

Our Fall Issue was a resounding success in all aspects. So many of you took the time to tell us the articles were outstanding that you overwhelmed our "Contrails" page. If your letter does not appear, it is only because we ran out of the allotted space. Others of you have sent in checks for $15.00 or more and very moving notes telling us to do whatever is necessary to keep the Bulletin coming. So here we are. Starting with the Spring 2010 issue, the subscription rate will be $15.00 per year which will include the four issues. Several of you sent in $10.00 checks to renew your subscriptions for 2010. We are sorry but we must ask that you follow that up with another $5.00. To identify those subscribers, we have added an asterisk to the DECEMBER 2010* above your name. Please respond early to this request and save us the expense of time and money to send out reminder cards.

For the first time, our cover is in color! Our very good friend, famous author and historian Walter Boyne, asked renowned Aviation Artist Keith Ferris if he would provide us with one of his paintings illustrating a North American Aviation aircraft in action. As a result, we learned that Keith has had a long relationship with NAA and he was delighted to help us! We chose his *"Nowotny's Final Encounter"* painting for our cover.

Do you ever get enough stories about the P-51? We don't! In the July 2009 issue of *Aviation History* we found an article about the Mustangs flying and fighting over Japan. We contacted the author, John Lambert, and received not only his blessing but a collection of photographs to accompany the article. We then contacted the Publishers, Weider History Group, and they were most gracious in granting us permission to reprint the article. Hence, here is the final chapter of the North American Aviation P-51 Mustang in action during World War II.

In this issue we bring the first of a three-part article of the role that North American Aviation and its subsequently named Rockwell played in manned spacecraft operations at Cape Canaveral and at the Kennedy Space Center during the early years when the manned Apollo program was conceived, developed and implemented with the successful landings on the Moon. And what better author to provide us with the staggering problems encountered, their brilliant resolutions, the personalities involved and the magnificent accomplishments achieved than the man that had a vital role in most of these operations, Bill Edson.

After the Apollo program came the Apollo/Soyuz and then the Skylab program. A modified Saturn IVB stage, it was NASA's first space station. Three crews of three astronauts went up in Apollo modules to Skylab, first to install a makeshift parasol solar shade to provide thermal control, to install a solar shield, to boost the Skylab to a higher orbit and finally, to conduct experiments. We cheered at first when the crew members exercised in this giant barrel by running round and round. Then, we agonized as the Skylab started to descend and we had to try to save it! Jack Potts gives us a wonderful article on the attempt to save the Skylab!

As is our custom, we close out the year with a review of the issues we printed this year to see and to determine what can be done to make the Bulletin better in the coming year. It is quite a challenge because the articles and the authors were outstanding! One sad aspect, however, of this scan were the many familiar names that showed up in the Silent Majority. We know that the years pass quickly but we must never, never give in to the debilitating aspects of "old age". So stand up, keep moving!!! Make it hard for the Devil to find you! And don't forget to send in your $15.00 renewals to the Bulletin!

The 48th Bald Eagles Reunion will be held Saturday, April 24, 2010
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Mustangs Over Japan

by John W. Lambert

As ninety-one North American Aviation P-51D Mustangs of the 15th and 21st Fighter Groups approached their rendezvous point on April 7, 1945, the pilots saw for the first time their ultimate objective: the Japanese homeland. *"The weather was clear and we saw the coast of Honshu and old Mount Fujiyama standing out just like it did in the pictures,"* recalled Major Jim Vande Hey, CO of the 78th Fighter Squadron. *"It was an unmistakable landmark."*

The Mustangs soon formed up with their charges, one hundred and three Boeing B-29 Superfortresses of the 73rd Bomb Wing. *"It was a real spectacle,"* said Captain Art Bridge of the 45th Fighter Squadron. *"The -29s were just finishing their assembly in a grand circle as we arrived. I could see the lead B-29s were at 12,000 with the rest staggered back all the way up to 18,000. My flight was covering the point and we began to scissor to maintain our airspeed and not get ahead of the bomber stream."*

Crossing the coast of Honshu, the P-51 pilots dropped their 110-gallon auxiliary wing tanks as they began to spot the first head-on feints from a force of more than 100 Japanese interceptors. In a short time, more than 300 aerial adversaries converged in the flak-smudged sky over Tokyo Bay. When the smoke cleared and the Mustangs returned to their Iwo Jima base, the "Sun Setters" of VII Fighter Command were credited with 26 Japanese planes destroyed, one probable and five damaged, at a cost of two P-51s and one pilot. More important, only three B-29s had been lost-two to flak and one to an aerial bomb. It was an auspicious start for VII Fighter Command's very long range (VLR) campaign, which would see the Mustangs make 50 more runs to the Japanese Home Islands before V-J Day.

Carrier and land-based air power defined the U.S. Pacific strategy in World War II. With each advance, the Americans sought to achieve aerial supremacy, interdict Japanese maritime supply lines and isolate the battlefield. As the leapfrogging strategy proceeded, enemy garrisons were destroyed by air power and the islands either seized or bypassed. The targets of American air strength were largely tactical until B-29s of the Twentieth Air Force began the final heavy bombing campaign against Japan's industrial centers in 1944, operating from bases in China and the Mariana Islands, some 1,300 miles from Honshu. When Iwo Jima was secured in March 1945, it became a haven for damaged or low-on-fuel B-29s as well as a base for the escort fighters of VII Fighter Command.

For the D-model Mustangs it was 625 nautical or 718 statute miles to the coast of Honshu, due north of Iwo over a trackless expanse of the North Pacific totally lacking in alternative landing sites. Missions routinely lasted more than seven hours.

While the April 7th mission was a notable success, it was also vengeance of sorts for the fighter squadrons of the old Hawaiian Air Force that had suffered an ignominious beating on December 7, 1941. The 15th and 21st Fighter Groups rose from the ashes of that "Day of Infamy," and many of their command, group and squadron leaders were veterans of the Pearl Harbor attack.

After brief episodes of combat in the Gilbert-Marshall Islands campaign, the pilots of VII Fighter Command had undergone intensive training for the VLR missions that would be their specialty. Other than a few days of support missions before Iwo had been secured and some periodic shuttle flights to the rocky outcropping of Chichi Jima, 147 miles north of Iwo, there were no other targets for the P-51s besides those in the Home Islands. The Mustang force, eventually enlarged with the May arrival of the 506th Fighter Group, concentrated its main effort on the Honshu region between Osaka and Tokyo. (A Republic P-47N group, the 414th, arrived on Iwo in late July, in time for just three missions.)

Even before the first escort mission to Japan, the command had been blooded in one of the last ground battles on Iwo Jima. On March 26, 1945, the 21st was bivouacked in a tent camp on the west side of the island when 300 Japanese troops suddenly surged from their underground bunkers before dawn. They struck the unprepared Americans with swords, grenades and small arms. Pilots and ground crews fought back stubbornly at close range in the darkness until a Marine contingent arrived to help destroy the enemy force.

"Our first thought was to get clear of the tent, which seemed to be a primary target," recalled Captain Jim Van Nada of the 72nd Squadron. *"We didn't know where we were going because it was still dark and we weren't sure from which direction the attack was coming. Three of our pilots (Howard, Rogers, and Canfield) made it outside the tent. But as Ralph Bruner and I got to the door, a grenade landed about three feet in front of us. The concussive effect knocked us out and blew us back into the tent. When we came to, we were both lying on the tent floor bleeding from head wounds."*

Don Howard had been killed, and Lieutenants Frank Rodgers and George Canfield, both wounded, stumbled back into the tent where Van Nada and Bruner were assembling a rampart of B-4 bags and ammo crates. The Japanese were slashing holes in other tents and tossing grenades inside, where some men were trapped.

"After our skirmish line had swept the camp and cleared the last of the tents, I joined Marines throwing 5 1/2-second grenades at the Japanese in a trench," said the 531st Squadron's Captain Harry Crim. *"We held the grenades until the last second to get an air burst over the ditch. The sun was just coming up as we hit the trench. I was 10 feet away when a Japanese soldier jumped up and threw a grenade right at me. I rolled and it went off, blowing up a lot of sand and tearing my pants, but it never touched me. I called for a grenade and tossed it over on him, returning the favor."*

The 21st lost 15 men killed and 50 wounded. The seriously injured, including the group CO, Colonel Ken Powell, were evacuated to Guam and Hawaii.

VII Fighter Command's first VLR mission to Honshu was followed by another escort job on April 12th. Thereafter, the Mustangs alternated their escort duties with fighter sweeps designed to lure the Japanese air forces into battle or to destroy them on their airfields.

The VLR missions followed a highly orchestrated routine. With B-29s serving as pathfinders, the Mustangs would assemble near Iwo in gaggles of 60 to 170. The outbound leg of each mission was performed at 205 mph with engines turning about 2,000 rpm and 29 to 30 inches of manifold pressure, in auto-lean. The trick was to keep the Merlins turning just above the cutout point. Every half hour the formation would run engines

up to full power in order to clean out carbon buildup. The process, aggravated by Iwo's fine talc-like volcanic sand, caused engines to wear out prematurely and resulted in many aborts. The P-51s flew on the auxiliary wing tanks (110-gallon and later 165-gallon) until they approached Honshu, then pilots switched to their 85-gallon fuselage tank and returned on the pair of internal 55-gallon wing tanks. The rigid cruise-control techniques brought fuel consumption below 40 gallons per hour, considered an early threshold of perfection. *"We got so good that we would fantasize about flying our planes the 2,400 miles back to Hawaii,"* remembered Lieutenant Leon Sher, 47th Fighter Squadron.

Combat over Japan, generally performed at or near maximum power, ignored cruise-control techniques. More than a few aircraft ran out of fuel short of Iwo Jima, triggering Air Sea Rescue (ASR) elements. Many others, flying on fumes, made straight approach landings at Iwo.

Major Vande Hey recalled how a "Big Friend" nursed him home: *"When I started back I called a B-29 and told him I was low on fuel and to take me home by the shortest possible route. He said, 'Get on my wing, little brother.' We went through some weather without difficulty, and about 100 miles from Iwo he led me through an overcast and asked how I was doing. I looked at my tank gauges and said, 'I don't think I'm going to make it:*

"The B-29 alerted rescue, Dumbo (an Air-Sea-Rescue flying boat) came out on our heading, and I started saying the rosary. We broke out at about 4,000 feet and Iwo was dead ahead. Being a poor swimmer, I was ready to dead stick it from 4,000 feet. I made a straight-in approach, dropped my gear, and when I three pointed it, the engine conked out. I didn't even have enough gas to taxi."

After the first few escort and sweep missions, the Mustang drivers began to notice that the Japanese were reluctant to engage. Air-to-air combat most often occurred when USAAF squadrons stumbled upon enemy aircraft at lower altitudes that seemed to be trying to get out of harm's way. Indeed, the Japanese still had thousands of aircraft of various types (the U.S. Strategic Bombing Survey estimated as many as 10,000) in the closing months of the war, and they began husbanding that force to counter the anticipated invasion. Despite that strategy, and the reluctance of the Japanese army and navy to coordinate their



Photo from the John Lambert Collection

A Boeing B-29 navigates toward the Japanese Empire with Mustangs of the 45th Fighter Squadron, 15th Fighter Group. Even on the bomber escort missions, the Mustangs would fly their own route, rendezvousing with the bombers off the coast of Japan.



Photo from the John Lambert Collection

Mustangs of the 506th Fighter Group begin taking off in pairs from Iwo Jima. Dust from departing P-51s often made successive takeoffs hazardous.

air units in defense against B-29 raids, periodic aerial brawls occurred that rivaled the great battles over Europe.

On May 29 more than 450 B-29s, escorted by about 100 Mustangs, raided Yokohama for the first time, setting the stage for one of the biggest air battles of the Pacific War. The bombers encountered aggressive Japanese army and navy units, and a furball quickly developed as some 650 aircraft clawed at each other. One particularly daring Japanese pilot (believed to be naval ace Sadaaki Akamatsu) shot down 45th Squadron Lieutenant Rufus Moore and sped through the escort with seeming impunity. *"He made us look like a bunch of truck drivers,"* commented Lieutenant Jack Wilson of the 531st.

During the hectic action, a flight of 45th Squadron P-51s veered too close to their charges, and quick-triggered B-29 gunners riddled Lieutenant William Brown's plane. The action ended after three-quarters of an hour of sustained violence, leaving Yokohama a flaming ruin.

It was VII Fighter Command's most successful mission. Although seven B-29s fell to flak and fighters, the Mustang pilots claimed 28 kills, eight probables and 23 damaged. Only one P-51 was lost over Japan, but long after combat subsided Mustangs continued to go down. Bill Brown, his P-51 full of .50-caliber holes, was the first to go, parachuting close to the coast of Honshu. The U.S. Navy submarine *USS Pipefish* rescued him.

Lieutenant Bob Roseberry's 78th Squadron P-51 refused to jettison its wing tanks, reducing his airspeed and inviting attack by Mitsubishi J2M3 "Jacks." *"They apparently scored several hits on my fuel tanks or gas line,"* he said. *"After furious lumbering maneuvers, I found myself all alone with two wing tanks and a slightly used Mustang. My wingman had lost me and the squadron had turned out to sea."*

Roseberry nursed his crippled fighter back to within 60 miles of Iwo Jima before parachuting into the sea and climbing into his one-man life raft. A Northrop P-61 Black Widow was soon orbiting overhead, providing a fix for the destroyer escort Brough. The ship's officers got him dried out sufficiently for a card game that cost the aviator all his available cash, just $10, causing one of the crew to reflect, *"It hardly pays to fish you guys out for only ten bucks a head."*

With a shattered canopy and 20 mm shell holes through his wing, flap and fuselage, the 47th Squadron's Lieutenant Sher was

miraculously unhurt as he coaxed his P-51 toward Iwo. After seven hours and 35 minutes of flying, he still didn't fully appreciate the extent of the damage as he made a cautious approach to Runway 5. He remembered, *"My tail wheel wouldn't come down, but I didn't realize that and was trying a three point landing on only two points. However, I didn't have enough wing area left and stalled out too early. All I could do was bury the nose in the ground. The Mustang pitched up vertically but didn't go over and flopped back down, breaking its spine."*

As the weeks passed and Japanese aerial resistance began to diminish, VII Fighter Command was ordered to concentrate on airfield strikes. Tactical procedure dictated that one squadron remained as high cover while the others thundered down, full throttle, line abreast, to sweep the enemy field with .50-caliber fire. But as in a cavalry charge, some Mustangs outpaced others and could be seen later in gun camera shots. Captain Felix Scott, 46th Squadron, described one such hell-for-leather assault: *"We were down in the treetops strafing when part of the 15th Group came through us. We were dodging P-51s, tracers and land mines all at the same time. The mines looked like dish pans floating in the air. The Japanese were always late in firing them and they ended up behind us."*

The month of July saw 17 such sweeps and not a single high-altitude escort job. Tough as the air-to-air encounters often proved to be, the pilots preferred them to low-level strafing missions. Lieutenant Hank Ryniker, 47th Squadron, recalled one mission that claimed two 15th Fighter Group planes and pilots: *"We came across Tokyo Bay from the east, dropping down because of rain and clouds until finally we were orbiting at 2,000 feet, low and slow over the heaviest flak area I've ever seen. Amid heavy flak bursts and tracers I heard fellows call in, 'I'm hit,' 'My coolant's shot out,' 'My rudders are jammed,' and I felt cold fear. We encountered no fighters, just flak. You could see, fight and kill fighters, but there's nothing so futile as a wall of flak."*

"We were getting pretty gun-shy in July and August," said Major Robert W. Moore, CO of the 46th Fighter Squadron and leading ace of the 7th Fighter Command. *"By that time, I fully expected to be killed on a strafing mission. I did not feel the same way about air-to-air combat because we were generally better trained than the Japanese, and our equipment was better.*

"I was not arrogant nor felt that I could not be shot down by another fighter, but this did not worry me nearly as much as did strafing," he continued. *"I always figured that the worst gunner in Japan could shoot at least within several hundred yards of you and that if enough missions were flown, enough bullets would be fired at you to get you sooner or later. A bullet in a radiator, oil line, coolant line, gas line could be as fatal as one in the head. And you could not always bail out of a -51."*

The laws of probability began to catch up with VII Fighter Command during three successive airfield strikes on July 8-10, when 327 Mustangs sortied over Honshu. Forty P-51s, 12 percent of the attackers, were hit by enemy ground fire, and 13 were lost. Thanks to superb rescue efforts, seven pilots were saved.

On an August 1st mission to strafe Akenogahara airdrome near Nagoya, Major Moore's worst fears were almost realized. *"I flew over the field at approximately 10 feet altitude and actually had to raise the nose of the fighter to shoot into hangars,"* he said. *"This was not an ill-conceived action since the Japanese gunners in the reveted gun emplacements could not depress their automatic weapons low enough to hit you. I knew I was safer at 10 feet than I would have been at 200."*



Photo from the John Lambert Collection

As a 458th Squadron pilot awaits the signal to start engine and taxi, his crew chief stands on the wing to render any final assistance. In order to conserve fuel, engines were not turned over until the last minute.

"Outbound I strafed a line of ships at a small port and received a 37 mm hit in my left wing. The explosion blew out all of the ammunition and the covering doors over gun and ammo bays as well as puncturing my left tire." Moore's P-51 remained airworthy despite the damage, but he ground-looped on landing at Iwo due to the blown tire.

In late May, VII Fighter Command had added rockets to its airdrome strafing armament, increasing the danger to the pilots. Mustangs of one squadron in each group were outfitted to carry six 5-inch rockets in underwing positions along with two 165-gallon wing tanks. The factory markings on each P-51D wing warned: Maximum External Wing Load 550 lbs. *"We were carrying over 1,500 pounds under each wing, so we were flying the heaviest P-51s in the world,"* said Lieutenant Jack Wilson, 531st Squadron. *"The first 30 seconds off the ground, they staggered around like a chunk of lead."*

Lieutenant Paul Schurr, also of the 531st, recalled: *"We always hoped that we would locate airborne enemy units so we could tangle with them and not have to strafe. We jokingly referred to ourselves as the Kamikazes of the American Air Force. I always wondered if the rockets we carried were timed so that if one didn't turn away after firing, and then they went off just as we passed over them, one could shoot himself down."*

During the marathon missions on what became known as the Empire Run, death took many forms. There was death due to takeoff accidents, enemy action and anti-aircraft fire, as well as losses to mechanical failures and several fatalities due to parachuting, a high-risk venture from a Mustang. However, the single biggest cause of fatalities among the Iwo Jima-based fighter pilots proved to be severe weather. The Western Pacific bordering the Asian littoral was frequently a cauldron of bad weather. B-29s had endured high-altitude jet streams up to 100 knots, and massive storms frequently built up ahead of or behind missions.

For the pilots of VII Fighter Command, June 1, 1945 will forever be remembered as "Black Friday." On that day 184 Mustangs had been dispatched to Osaka for escort duties. Departing Iwo with three B-29s as navigation escorts, the fighters climbed to 10,000 feet. Consolidated B-24s preceded each mission on weather reconnaissance, and the bomber stream had already gone ahead with no reported problems. But 370 miles north of Iwo the Mustang pilots began to encounter a well-formed frontal zone that loomed with boiling cumulonimbus clouds soaring over 30,000 feet. They were like men at the sheer face of a mountain wall, contemplating the ascent.

The lead navigator first advised the fighter leaders that he intended to climb over the boiling mass, but the formation was already too close for that, and fuel considerations would not permit a gradual spiraling climb or circumnavigation. Lieutenant Colonel Jack Thomas, CO of the 15th Fighter Group, warned the B-29 leader, *"If you try to penetrate that front, this formation could blow up like a bomb!"* Despite his protest, the lead B-29 headed into the ominous mass.

As the big bombers led their flock into the maw of the evolving system and the huge formation was swallowed by the increasingly heavy front, the Mustang pilots tightened their formation, striving to maintain visual contact and unit cohesion. P-51 leaders struggled to fly on instruments through the horizonless environment, and then turbulence struck the formation. Groping for salvation, most flight leaders began to turn away from the mission heading and lose altitude. Chaos ensued as Mustangs began to tap wings and formations merged.

The Mustang pilots were battered by snow and rain as they fought to avoid collisions amid the convection currents. A few managed to turn away and return to Iwo, while some two dozen found daylight and proceeded north toward the devil they knew. When the day's grim toll was tallied, 27 P-51s had been lost, and ASR units recovered only two pilots.

Excepting the fatalities of the June 1st mission, ASR operations for the strategic air campaign against Japan were on the whole very successful, a marvel of service cooperation. There were five stations equidistant from Iwo to the shores of Honshu where Navy surface vessels and/or subs patrolled, coordinating with Consolidated OA-10 and Boeing B-17H Dumbos, B-29s, P-61s, and Navy PB4Y Privateers—watching over troubled fighter and bomber crews. Of the Mustang pilots known to have gone down at sea, 54 percent were rescued, some from under the guns of the Japanese.

Even the pilots who survived VLR missions required special medical attention. Nearly eight hours in a coffin-like cockpit, astride the AAF's version of the cavalry's old McClellan saddle, turned young men into quasi-arthritics. They often had to be helped out of the Mustangs, and it took five to seven days before they were again able to strap on a parachute and survival kit and climb into the cockpit. The command surgeon, Lt. Col. Joseph Walther, inveigled Navy Seabees into tapping the boiling hot springs under Iwo and building a spa of sorts. After debriefing, aching pilots were helped into tubs of hot water and handed an ice-cold Australian beer, followed by a rubdown.

Due to the marathon nature of the VLR flights, tours of duty were usually limited to 15 sorties. Major Harry Crim had served a previous tour of combat in the Mediterranean, compiling 50 missions and 21 hours in a Lockheed P-38. In just 18 sorties from Iwo to Japan he was credited with 134 hours, almost 7 1/2 hours per mission. Crim was one of five VII Fighter Command Mustang pilots who achieved ace status.

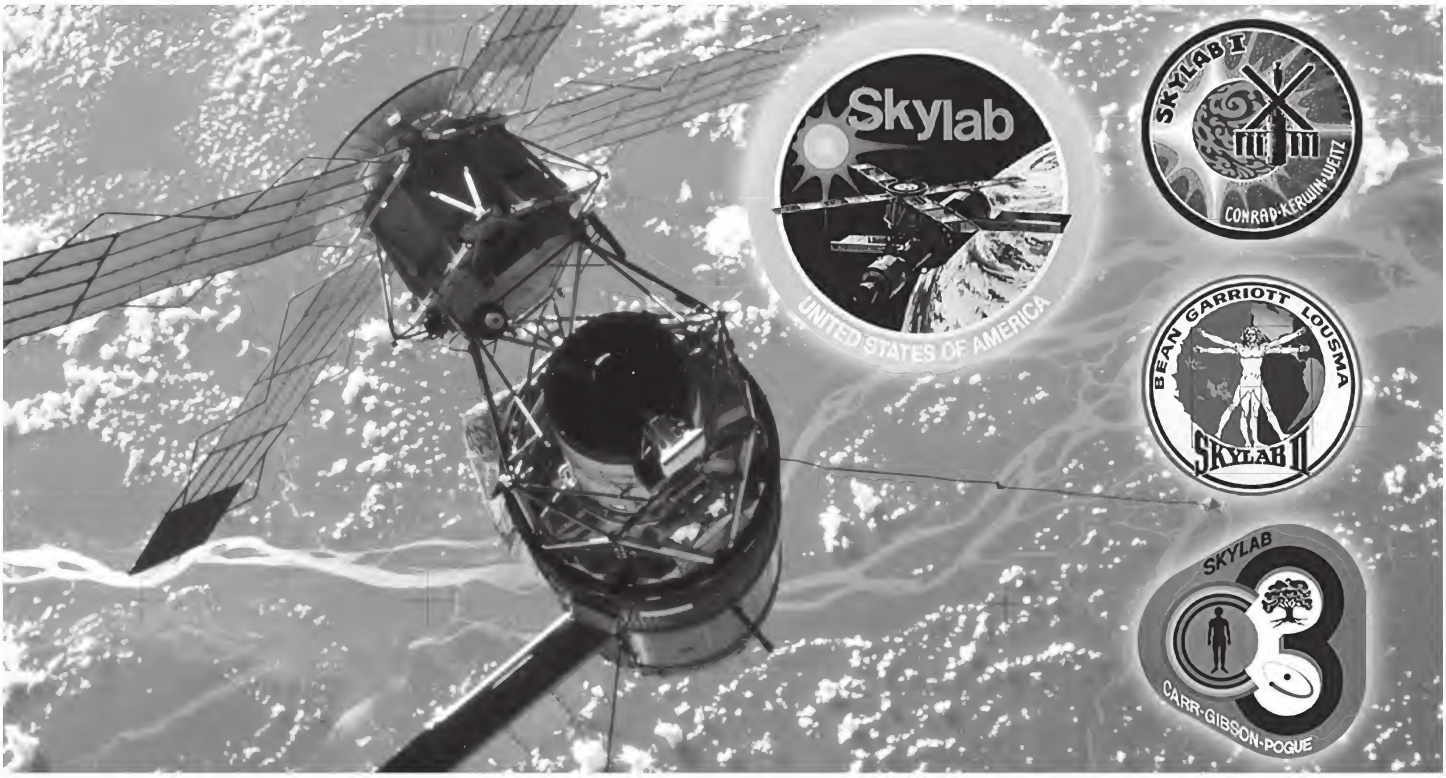
The VLR flights were achievements in themselves, but once over Japan the Mustangs destroyed 225 enemy aircraft in aerial combat, probably destroyed another 56 and damaged 119. Claims from strafing were 219 destroyed and 450 damaged. The campaign exacted a heavy toll from the VII Fighter Command pilots: in-flight fatalities due to enemy action, weather and accidents totaled 91. Never again would American fighter pilots fly such long-range missions without air-to-air refueling.

About the Author: After a four year stint in the USAF during the Korean War and 30 years in the barge business on the Mississippi River, John and his wife started Phalanx Publishing which produced over 30 titles related to World War II aviation history. His own works include The Long Campaign: The 15th Fighter Group in WWII *and* The Pineapple Air Force. *A widower, John is now retired and living in Minnesota with his yellow Lab Chloe.*

Editor's Note: We wish to express our appreciation to the author, John Lambert, and the publishers of Aviation History magazine, Weider History Group, for granting the NAA Retirees Bulletin permission to reprint this article from the July 2009 Issue of the magazine. The Weider History Group publishes ten different outstanding military history magazines and can be reached at 1-800-435-0715 or HistoryNet.com.

Saving Skylab

by Jack R. Potts



Introduction

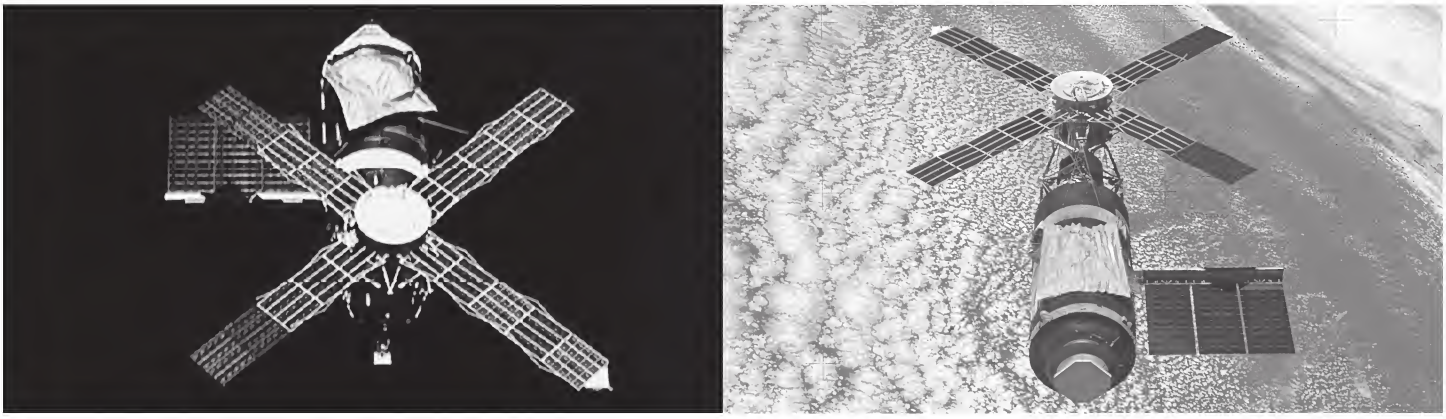
Skylab was NASA's first Space Station. A modified Saturn-IVB stage, manufactured by McDonnell Douglas, it was launched on May 14, 1973. During launch the meteoroid shield and one of two solar array panels were lost due to aerodynamic loads. The meteoroid shield was a second skin that was to be deployed on orbit above the pressure hull. It also provided a thermal shield from the sun to help control the Skylab internal temperature.

The first of three Apollo crews, launched on May 25, 1973, carried up a make shift parasol solar shade to help provide thermal control of the Skylab. The mission lasted 28 days. This crew also freed up the remaining solar array panel, which was tangled up with a small piece of debris from the meteoroid shield, allowing it to fully deploy. The second mission was launched on July 28, 1973 and lasted 59 days. The second crew installed a twin pole solar shield.

The third mission was launched on November 16, 1973 and lasted 84 days.

Before the third crew left, the Skylab was raised to 433 x 455 km (234 x 246 nm) orbit by the Apollo spacecraft and had a forecasted orbital life of eight to ten years. A rough plan was laid out by NASA to develop a Reboost Module which would be launched by the Shuttle after the four Orbital Flight Test (OFT) missions were completed. The Reboost Module would either place the Skylab in a higher orbit for later refurbishment by Shuttle or perform a safe deorbit of the Skylab into the ocean.

After the third crew returned home on February 8, 1974, the Skylab's atmosphere was vented to space and it was put into a gravity-gradient-stabilized attitude with the docking adapter pointed away from the earth. Most of the onboard systems were shut down. Skylab could still respond to telemetry signals whenever its solar panels were in sunlight.

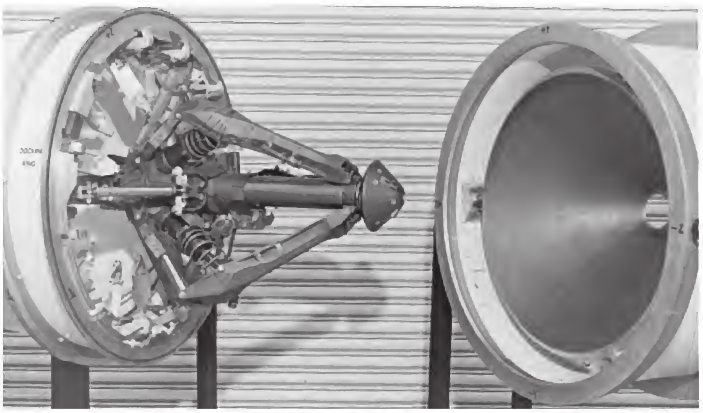


Parasol Solar Shade (left) and Twin Pole Solar Shield (right)

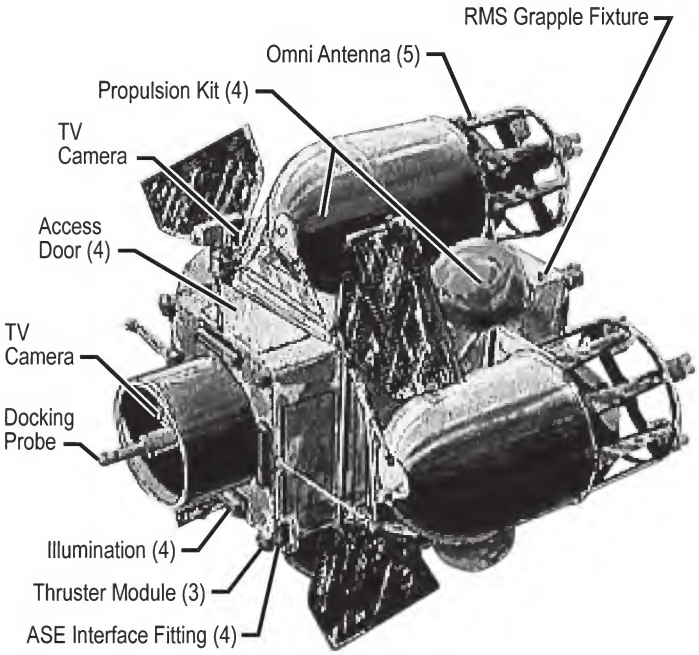
Skylab Reboost Module

The contract for the Reboost Module was given to Martin Marietta in November 1977. The module consisted mainly of three major components, a propulsion system, a small modified "Teleoperator" which was being proposed by Martin Marietta for use on Shuttle and an Apollo docking ring with probe.

The original Teleoperator was a cube (two feet square on its sides) with small cold gas jets in each corner (24 - 0.1 lbs) for control (not used on the Reboost mission). A TV camera mounted on the front to provide the remote operator information about what was in front of the Teleoperator. The Teleoperator attitude and translation control logic would be used to control the Reboost Module maneuvering, attitude control and reboost functions.



Docking Ring and Probe (left) and Docking Drogue located on Skylab (right)



Skylab Reboost Module

Total Length	3.3 m (10.8 feet)
Max. Diameter	3.2 m (10.4 feet)
Total Mass	4,392 kg (9,682 lb)
Total Propellants	2,744 kg (6,049 lb)

Reboost Module Characteristics

Rockwell International in Downey was given the job to provide an Apollo docking ring and probe and to integrate the Reboost Module into the Shuttle as a payload. An operable Apollo docking probe was obtained, and the required testing and checkout Ground Support Equipment (GSE) was located in the Apollo tooling being stored in the lot on Imperial Highway. The probe was tested and found to be in good condition. One potential concern with the docking probe was the N_2 supply bottle status, which was used to withdraw the probe once the docking/capture had been completed. It was over five years old and there was no way to verify the N_2 charge status. No one wanted to disassemble it because the buildup tooling was not available. The Downey docking system engineers were able to determine from drawings that a port to the N_2 pressure passageway could be drilled into the probe structure. No one was able to relax until the drilling operation was successfully completed. The probe withdrawal N_2 supply would be provided as a separate tank on the Reboost Module. A new docking ring was machined for mating with the probe and Martin Marietta's Reboost module.

Payload Integration

The Reboost Module was mounted in the Orbiter midbody on its own aerospace support equipment (ASE) and deployed by the Orbiter RMS, using a grapple fixture mounted on the Reboost Module. Power for the module was provided by batteries which were powered off until the unit was ready for deployment. The Reboost Module would share the Shuttle midbody with the Development Flight Instrumentation (DFI) module. All interface load, thermal and related analyses were performed to assure compatibility with the STS system.

Shuttle Development Schedule

In late 1977, the original schedule for the first OFT mission was late 1979. The second Shuttle flight had been selected to rendezvous with the Skylab and release the Reboost Module to dock with the Skylab. This mission was designated as STS-2A and the assigned crew consisted of Fred Haise and Jack Lousma. A four phase program was being proposed by NASA for the Skylab extended use.

1. In 1979, boost Skylab into a higher storage orbit
2. In 1982/83, refurbish Skylab by two Shuttle missions
3. In 1984, dock a new solar-powered module to Skylab and start 30 to 90 day missions
4. In 1985 to 1989 expand capabilities to support up to eight astronauts

In reality the STS-2 mission was flown in November 1981.

Skylab Becomes a News Item

The following was taken from *"Living and Working in Space: A History of Skylab"*, NASA-SP-4208 by David Compton and Charles D. Benson, 1983.

Early in 1978 Skylab was rudely thrust into the glare of publicity like earlier NASA activities, by the Soviet Space Program. The unmanned Cosmos 954, apparently as a result of system failure, flamed into the atmosphere over northern Canada, scattering pieces of its nuclear-fueled electrical power module over a wide area. The module contained 45 kilograms (99 lb) of Uranium highly enriched in the fissionable Uranium-235 isotope, and an intensive search for the pieces was started immediately.

As far as NASA was concerned the most stimulating reaction was a query from the State Department. In view of worldwide interest in Cosmos, State wanted to know, what did NASA propose to do about Skylab (the cluster contained no radioactive material and that it would not drop below 278 kilometers (150 nm) before October 1979). Diplomatic repercussion were possible almost anywhere in the world if a piece of Skylab fell on a citizen somewhere, since the laboratory's orbital path took it over the heads of 90% of the world's populations.

Skylab Life Time Forecast Concerns

Unexpected high solar activity (~11 year cycle) made the Skylab's orbit decay faster than expected. With a great deal of effort, NASA Marshall Space Center was able to regain control of the tumbling Skylab and place it in a gravity gradient attitude to reduce the atmosphere drag effect. This required support from a few engineers that had originally worked the Skylab program in real time. Some of the effort consisted of:

1. Finding a UHF space transmitter/receiver, that was still in operation (Kindley Naval Station in Bermuda had a UHF transmitter whose signals could operate telemetry equipment aboard Skylab)
2. Recovering the ground software and setting up support consoles
3. Determining the Skylab status
4. Charging the Skylab batteries
5. Establishing attitude control of the Skylab Assembly
6. Placing the two Control Moment Gyros (CMGs) back in operation (the third CMG had failed during the third mission)

The above effort had placed the Skylab in a gravity gradient attitude by June of 1978. The expected life prediction of the Skylab at this time was a little over two years, since a lot of altitude had been lost due to higher atmospheric drag resulting from unexpected high solar cycle.

Skylab Final Days

NASA Headquarters was setting up an organization to deal with the problems that would arise when Skylab came back to earth. On July 25, 1978, a Skylab Contingency Working Group was established to coordinate interagency planning. Under the direction of William G. Bastedo, this group was responsible to inform a host of foreign governments of the current state of affairs.

The year-long effort to keep Skylab aloft ended in December 1978. Although the Reboost Module was approaching final assembly, problems with Shuttle's main engines had delayed critical tests, and program officials clearly saw that the Reboost mission could not be launched by October 1979. The President was advised on December 15, 1978 that Skylab could not be saved but that NASA would do all it could to control reentry to minimize the risk to populated areas. John Yardley, associate administrator for the Office of Space Transportation Systems (successor to the Office of Manned Space Flight), provided details of the decision to the press on the 19th.

For six more weeks the flight controllers worked three shifts a day, holding Skylab in its low-drag attitude until policymakers could decide exactly how to manage the reentry. As soon as the decision was reached, a detailed plan was sent to the Departments of State, Defense and Justice and to the Federal Preparedness Agency for comment. A meeting with NORAD on January 9, 1979 established radar tracking requirements and set up formal technical liaison. NORAD reentry information would be transmitted to NASA field centers and to a coordination center to be set up by Yardley's office to direct the entry. The operation was only slightly less elaborate than preparations for the return of an Apollo flight.

Work at the control center at JSC had slacked off somewhat in early February, following a decision to return the workshop to solar-inertial attitude. Since power management was much easier in this attitude, round-the-clock monitoring of systems was suspended for several weeks and many of the flight control people were sent back to their regular assignments. Attitude control too was comparatively easy in solar inertial, in spite of the increased drag, but it was expected to become more difficult as the workshop lost altitude. From February through May, however, the control center simply kept an eye on Skylab while plans were made for its last few orbits.

Toward the end of April, NASA Headquarters issued its first forecast of a reentry date calculated from NORAD's model. On the 25th, when the workshop had fallen to about 320 km (173 nm), NORAD estimated a probability of 50% that Skylab would come down by June 19th with a 90% chance that it would reenter between June 13th and July 1. This format was used consistently for the rest of the waiting period, because it was impossible to give a more precise estimate until reentry had virtually begun. Marshall's engineers used a slightly different forecasting model: they estimated reentry between June 15th and 22nd, but their estimates were never publicized. NORAD was in the business of tracking satellites and NASA used NORAD's forecast for public utterances.

By the end of May, engineers and managers had agreed on a method of controlling the reentry. Skylab would be placed in a high drag "torque equilibrium" attitude in which aerodynamic forces were balanced by the control moment gyros as long as they had the capability. This would subject the workshop to a known retarding force from which impact predictions could be made. Flight controllers could then reduce drag if necessary to shift the reentry point. When the cluster fell to 140 km (76 nm), it would be set to tumbling end-over-end, reducing the drag to a known level and allow a reasonably accurate prediction of impact. Theoretically, impact could be shifted by as much as five orbits using this approach. The torque equilibrium attitude made power management more complex, so the Houston Flight Control center went back to 24-hour surveillance and control.

The workshop was down to 261 km (141 nm) on the 20th of June, having descended 60 km (32 nm) in the previous four weeks. During June, NORAD issued prediction periodically; the median date (by which time there was an even chance that the workshop would have come to earth) moved from July 16th to July 12th, while the spread narrowed: July 7-25 predicted on 14 June, to July 10-18 on the 28th.

Early in July the end was approaching rapidly. The workshop became harder to control as it dropped into the denser atmosphere, and power supplies were increasingly difficult to manage. On July 9, 1979 the Skylab Coordination Center opened in NASA Headquarters. With direct telephone lines to NORAD, NASA field centers, the State and Defense departments, and the FAA, the center was capable of relay-

ing information and orders almost instantly. A closed-circuit TV display from Houston pictured Skylab's ground track for several orbits, as well as the existing position. Newsmen and other nonessential personnel were kept out of the operations room itself, but the closed-circuit TV, tracking charts, and periodic briefings kept the crowd in the larger newsroom informed. On opening day the center issued the prediction that Skylab would come down on July 11th between 2:10 a.m. and 10:10 p.m. EDT, most probably on its 34,981st orbit. It was then at an altitude of 190 km (103 nm). The following day it dropped 17 km (9 nm) and the reentry time was bracketed between 7:02 a.m. and 5:02 p.m. EDT on the 11th. The only question that remained was the timing of the final tumbling maneuver. During the last hours of July 10th it appeared that Skylab would reenter on the best possible orbit of the day on the 11th, an orbit passing across southern Canada and the east coast of the United States and then over a long stretch of open ocean to Australia, the next landfall. But early calculation of the debris pattern showed that if tumbling were initiated at 140 km (76 nm) as planned, the western end of the 7,400 x 185 km (3,996 x 100 nm) "footprint" would slightly overlap North America. JSC officials then recommended, and Headquarters concurred, that the cluster be tumbled sooner, to move the predicted impact area downrange. NASA picked an area about 1,300 km (702 nm) south-southeast of Cape Town, South Africa, halfway between North America and Australia and south of the shipping lanes, which would require tumbling at 148 km (80 nm). The command was executed at 3:45 a.m. EDT, and the workshop went into an end-over-end spin.

Skylab had one more trick up its sleeve, one that gave flight controllers some anxious moments on the last orbit. They expected the cluster to come apart before it passed over the east coast of the U.S., but radar operators at Bermuda reported only a single image. Over Ascension Island the workshop still had not broken up; a NORAD imaging radar clearly showing that even the fragile solar arrays were still intact. But the telemetry was faltering and stopped entirely as the craft passed south of Africa. This unexpected tenacity had shifted the impact ellipse considerably to the east, and there was a possibility that Australia would catch some of the heavy fragments, which would fall at the eastern end of the ellipse.



Large fragment of Skylab displayed at Perth, now on display at the United States Space and Rocket Center

NORAD computed that impact occurred at 12:37 p.m. EDT. Shortly after 1 p.m., the Washington control center received word that the area southeast of Perth, Australia, had indeed been showered with pieces. Spectacular visual effects were reported and many residents heard sonic booms and whirring noises as the chunks passed overhead in the early morning darkness. Officials waited anxiously for news of injury or property damage, but none came. Skylab was finally down and NASA had managed it without hurting anyone.

Examining their data after reentry, the NASA team decided that they had miscalculated drag during tumbling. It was a small relative error—only 4%—but it had shifted the impact zone hundreds of kilometers further East than they had anticipated. Fortunately, the reentry orbit passed over the sparsely settled ranch country of Western Australia, but it was a slightly inelegant end to an otherwise well managed reentry.

One Australian, in fact, profited handsomely from the overshoot. A San Francisco newspaper had offered $10,000 for the first authenticated piece of Skylab brought to its office within 48 hours of reentry, and on the morning of July 13th a claimant appeared. Stan Thornton, a 17 year-old beer truck driver from the small coastal community of Esperance, had found some charred objects in his back yard, bagged then up, and caught the first plane for California. He arrived without passport and with only a shaving kit for luggage, but the pieces were identified as remains of plastic or insulation from Skylab, and Thornton got his prize.

The Shire of Esperance fined the United States $400 for littering, a fine which remained unpaid for 30 years. The fine was paid in April 2009, when radio show host Scott Barley of Highway Radio raised the funds from his morning show listeners and paid the fine on behalf of NASA.

The annual Miss Universe pageant was scheduled to be held a few days later, on July 20 1979, in nearby Perth, Western Australia. A large piece of Skylab debris was displayed on the stage.

About the Author: Jack joined NAA as a Hound Dog Missile Tech Rep. after graduating from the University of Colorado in 1959. Returning to Downey in 1964, he joined the Apollo GN&C Design group. Having trained the first four prime and back-up astronaut crew (Apollo 7-10) on the Apollo GN&C simulator in Downey, Jack joined the Shuttle Payload Design and Integration group in 1974, developing most of the Shuttle mid-body payload interface concepts that were implemented. He managed the Skylab Reboost and the Shuttle Centaur Modifications and Integration contracts. He also worked in Advanced Program performing design definition studies for the HL-20 (Personnel Launch System), Shuttle Evolved Space Station, HEUS (High Energy Upper Stage for Shuttle), and the ISS Propulsion Module (which became a real contract until cancelled in 2002). He was involved in the Advance Shuttle Upgrade Design effort, the Orion Proposal, and the Future Combat System before retiring in 2007 with over 47 years of continuous service. Jack currently resides with his charming wife Joan in San Pedro, California.

NAA at Cape Canaveral and KSC – Part 1

by Bill Edson

Prologue

The intent of this article is to identify the role North American Aviation, and its successors played in the early years of the space program at Cape Canaveral and at the Kennedy Space Center. During the 1950s and 1960s the manned Apollo program was conceived, developed and implemented with the goal of landing a human on the moon, to carry out a program of scientific exploration of the moon and to achieve superiority in space. In order to provide a better understanding of the U.S. space program, I have included a discussion of political and aerospace history concerning some of the activities that preceded us and, subsequently, led to our successes. I have attempted to recognize, regardless of affiliation, some of the multitude of scientists, engineers, technicians and tradesmen, and companies and civil servants who were participants on the Apollo team which led to our success.

My article, incrementally presented in three parts, will discuss the magnitude of the total task that we, NAA, undertook and accepted as well as that for which other contractors and our NASA customer were responsible. I have attempted to specifically identify our roles and responsibilities throughout the 1960s and early 1970s as we provided leadership, ingenuity and support to Apollo, Skylab and Apollo-Soyuz. Finally, I will discuss the transition that was made from Apollo to Space Shuttle at KSC from the mid 1970s through the mid 1980s. Here, much of my emphasis will be devoted to processing the hardware and on our successes and our challenges.

Origin of "Cape" as a Missile Launch Area

The Missile Range at White Sands in New Mexico initiated operations at the close of World War II. The short Missile Tracking Range was located perilously close to heavily populated areas. In May 1947, a V-2 rocket strayed off course and crashed into a Mexican cemetery, causing a minor international incident. This incident re-enforced a possibility that the missile range might be moved to a more desirable location. In October 1946 the Joint Chiefs of Staff established a group to identify possible locations for a new missile range, to be shared by the various branches of the military. The British expressed a willingness to allow missiles to fly over the Bahamas. The past remoteness of the area that kept a large number of settlers away from Cape Canaveral now made it a perfect site for a missile range. Availability of the Banana River Naval Air Station which had been shut down when WWII ended, was also a deciding factor. In May 1949, President Harry S. Truman established the Joint Long Range Proving Ground as the Florida Missile Test Range. In 1954, the name was changed to the Atlantic Missile Range. The purpose of the Range was to provide missile test performance data on missiles launched from Cape Canaveral. The Banana River Naval Air Station, which eventually became Patrick AFB, became the Florida Missile Test Range Base. The Coast Guard opened its space on Cape Canaveral to missile use in February 1950. Additional land was required and the government obtained it from private owners either by negotiation or by condemnation.

Cape Canaveral, in the 1940s and 1950s was a scenic but comparatively unsettled place – beautiful beaches, excellent fishing areas, a 100 year-old lighthouse, scattered private residences, a few unpaved roads or trails, a dock used by fishermen, and wildlife including deer, wild boar, alligators, and rattlesnakes. Both welcome and unwelcome residents and many millions of pests that gave their name to Mosquito Lagoon to the north.

In 1950, construction workers on Launch Pads 1-4 cleared the usable pad areas by burning the underbrush and uprooting the palmettos with bulldozers. Because Launch Pad 3 was located on ground that was drier than the marshy areas designated for the other Pads, it was chosen as the launch site for "Bumper V-2" the first missile to be launched from the Cape. Construction began with the digging of a large hole about eight feet deep at the site of the launch pad. Underground access tunnels and equipment rooms to house power generators, support equipment etc., were built inside a compartmentalized "cement" box the size of the pad. A reinforced concrete launch pad cover measuring 100 ft x 100 ft was poured on top of the underground structure. Heavy trucks occasionally sank to their axels on the sandy paths that passed for roads. Steel painters scaffolding surrounded the missile to form the gantry or service support tower. Platforms made of plywood stood at various levels of the scaffolding. If too many workers climbed the piping at the same time, the rickety platforms seemed ready to fall down. Heat and humidity sapped the energy from the launch crew. The crew stacked sandbags around a shack originally built by the Army for weather protection, and turned it into a launch control blockhouse which stood a scant 300 feet from the pad. A row of trailers provided an additional work area from which they coordinated countdown information and reports from remote tracking sites. Even though the launch facilities were "primitive and makeshift", the launch pad was in a remarkably advanced state of readiness.

The spaceport was inaugurated on July 19, 1950 with an attempted Bumper V-2 #7 (a modified V-2 first stage, combined with a WAC Corporal second stage) launch. While the launch crew, consisting of the U.S. Army, General Electric and Caltech people, conducted the countdown; 100 newsmen waited on the beach to see the vehicle misfire. Bumper V-2 #8, a sister missile, was successfully launched five days later on July 24, 1950. The launch was supported offshore by Navy ships and at Cape Canaveral by trailer and truck mounted telemetry and communications equipment.

In July 1950, under the direction of the Army Corps of Engineers, construction of Port Canaveral began. The port was initially intended to be a deepwater port to allow berthing of range instrumentation and cargo ships. An agreement was reached with the British government to allow the construction of the first island tracking stations. Thereafter, the Cape was in almost continuous use as the armed services brought missiles – the Lark, Matador, Snark, etc. – to Florida for testing. In 1954, a landing strip was built at Cape Canaveral (the skid strip) to support the recovery of winged missiles – Snark, Navaho and Hound Dog – and over the years has been used as a logistical support tool for parts and people.

In the early 1950s, range tracking ships came on the scene to provide an increased down range communications network in support of the various launch programs. The use of range sup-



NASA GRIN Photo

On July 24, 1950, the first rocket launch from Cape Canaveral, Florida began with the launch of Bumper V-2 #8, a modified V-2 first stage combined with a WAC Corporal second stage rocket.

port ships peaked during the Apollo program and then declined as communication technologies improved. The Cape had its share of growing pains. The Korean War diverted funds from missile programs. The multi-service, Army and Air Force, Cape operational responsibility was clarified when DOD changed the official title of the Air Force unit managing the Cape to Headquarters, Air Force Missile Test Center. In 1953, the Air Force contracted with Pan American World Airways to operate the range on a day-to-day basis (cafeterias, security, tracking ships, etc.) and with the Radio Corporation of America (RCA) for the technical aspects of range operations.

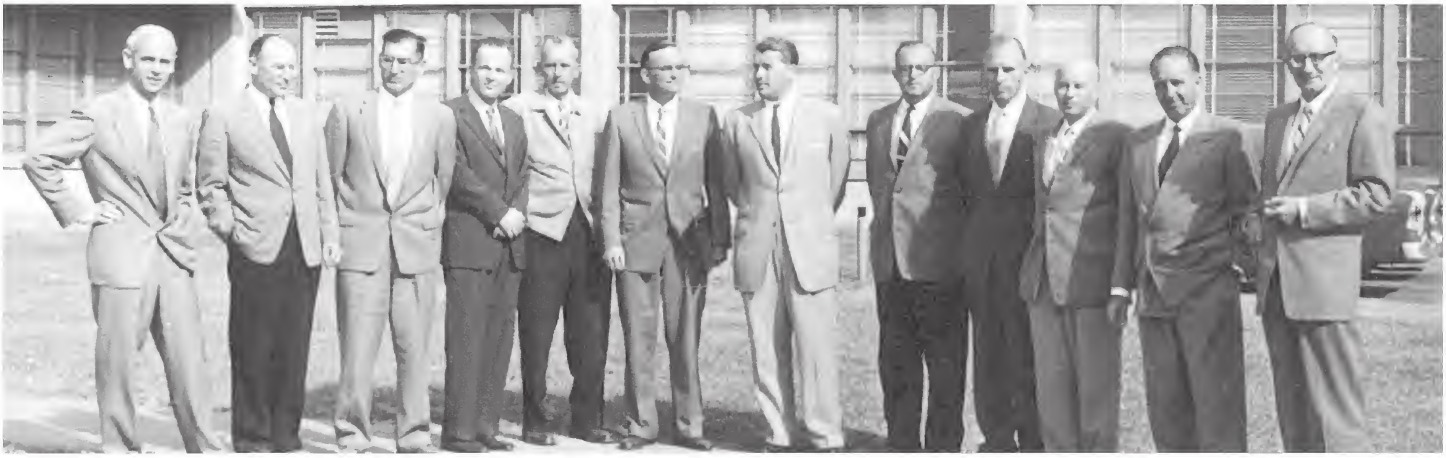
With the launch of Redstone #1 in August 1953, the Missile Firing Laboratory (MFL) inaugurated the testing of ballistic missiles. By the late 1950s, the Cape Canaveral skyline had distinctive features. Umbilical towers rose along "ICBM Row" with fixed concrete launch pads, flame deflectors, mounting pedestals on which to erect the launch vehicle, mobile service structures to provide access for maintenance, and test of the hardware and blockhouses for local command and control of the launches. A network of communication links between the "Cape" and the range brought the operation to life. Since the first Bumper launch in 1950, Cape Canaveral has been the scene of numerous launches (Redstone, Jupiter, Pershing, Polaris Thor, Atlas, Titan, and Minuteman, etc.) each of which has relied on some aspect of these support structures.

German Scientists Enter The Picture

Dr. Wernher von Braun, a German rocket physicist and astronautics engineer, became one of the leading figures in the development of rocket technology both in Germany and, later, in the United States. He was the central figure in Germany's pre-war rocket development program and responsible for the design and realization of the V-2 combat rocket during World War II. After the war, he and some of his rocket team members were brought to the United States where they were initially employed by the U.S. Army.

After arrival, some members of their team were assigned to work at the Aberdeen Proving Ground in Maryland where they continued with their rocketry experiments. Von Braun and the remainder of his staff were transferred to Fort Bliss, Texas, a large army installation north of El Paso. While there, they trained military, industrial and university personnel on the intricacies of guided missiles. As part of their job, they helped to refurbish, assemble and launch a number of V-2s that had been shipped from Germany to the White Sands Proving Grounds (WSPG). While at White Sands, a team of scientists under von Braun's direction launched Bumper 5 from the WSPG which constituted the first penetration of outer space by a U.S. missile.

In 1949, Redstone Arsenal (RSA) in Huntsville, Alabama was officially activated as the site of the U.S. Ordnance Rocket Center. Dr. von Braun and his team of German scientists and technicians were transferred to the Redstone Arsenal. In 1950,



Bill Edson Photo

The lab directors of the Rocket Team in the U.S. Army's Guided Missile Development Division at the Redstone Arsenal in Huntsville, Alabama. All were highly experienced astronautical pioneers. Dr. Wernher von Braun is at the center (seventh from left).

the Redstone Arsenal officially entered the missile era when the DOD assigned it the responsibility for research and development of guided missiles for the United States. Also in 1950, von Braun and his team supported the Bumper 8 launch at Cape Canaveral.

In 1955, President Eisenhower announced that the U.S. would undertake the construction of man-made satellites to travel "at incredible speeds around the earth, 200 or 300 miles above its surface." In 1956, the Army Ballistic Missile Agency (ABMA) was assigned responsibility for the Redstone missile and for the Intermediate Range Ballistic Missile (IRBM) programs. There became a growing perception that America lagged behind the Soviet Union in the emerging space race. American authorities then chose to utilize von Braun and his German team's experience with missiles to create an orbital launch vehicle. Studies of a large clustered engine booster to generate 1.5 million lbs thrust were begun by the ABMA.

In 1957 the Soviet Union launched Sputnik I, the first man-made earth Satellite. Later in 1957, ABMA submitted a proposal to the DOD for a "National Integrated Missile and Space Vehicle Development Program" suggesting the need for a booster with 1.5 million lb thrust capability. In January 1958, the Explorer satellite, the first U.S. earth satellite was launched by ABMA on a Jupiter-C launch vehicle, a modification of the Redstone missile and a direct descendant of the V-2.

Late in 1958, AOMC (Army Ordnance Missile Command) and the Defense Advanced Research Project Agency (DARPA) signed a memo of understanding to the effect that the Saturn design will begin at ABMA under Army management. Saturn design studies were authorized to proceed at RSA (Redstone Arsenal) for development of a 1.5 million lb thrust cluster engine first stage.

NAA Postures Itself For Space Market

While von Braun and his team in Huntsville were assuming the lead of the U.S. space effort and Cape Canaveral was strengthening its hold on the launch market, NAA had been posturing itself to secure a major role in the development of research aircraft, rocket engines, electronics, missiles and spacecraft. Having demonstrated a tremendous scientific and engineering capability during World War II, Dutch Kindelberger and Lee Atwood were ready to move into this totally new field of Space.

Recognizing the need for improved rocket engines based on the development of the German V-2 missile, they invested in a rocket engine test facility in Santa Susanna, California and a supersonic wind tunnel facility at Los Angeles International Airport where they worked to adapt the V-2 for other potential uses. The NAA NATIV, North American Test Instrument Project, launched numerous small missiles in 1948 and 1949 at Holloman AFB in New Mexico. Initially, the work was considered of little significance and was funded at a low level, but the political frustrations on the Korean peninsula changed the priorities. Their investment paid off when NAA received a contract from the U.S. Air Force for the development of the Navaho Missile, a rocket boosted intercontinental cruise missile later modified to be the XSM-64 and the SM-64A. The Navaho contract assisted NAA in developing expertise in rocket engines, inertial navigation systems and supersonic aerodynamics.

In 1946, Kindelberger became Chairman and Chief Executive Officer and Atwood became President of the NAA Aerophysics Laboratory. In that time frame, establishment of NAA at the Downey facility was implemented. In 1953, a NAA Rocketdyne Redstone A-7 propulsion system was chosen to power the first American-made large ballistic missile downrange at Cape Canaveral. With that happening, North American Aviation rocket engine researchers established their presence at Cape Canaveral and since that time have provided rocket engine technical support to virtually all of the major rocket and spacecraft programs. In the mid-1950s the NAA Rocketdyne Division was established within NAA and has become the premier American producer of liquid fueled rocket engines.

In that same year NAA received a contract to design and to build a research aircraft, the X-15. The activity to design and to build the vehicle was led by Harrison Storms. In March of 1956, NAA received a contract for the design, development, test and production of the Hound Dog, a supersonic air to surface cruise missile to be carried by a B-52. Later in 1956, the XSM-64 (Navaho) development test program was initiated at Cape Canaveral. The first flight ended after only 26 seconds when the vehicle disintegrated due to a longitudinal oscillation problem. The Navaho had numerous problems and all four launches conducted between November 1956 and June 1957 ended in failure. The U.S. Air Force cancelled the development phase of the program in July 1957. However, test flights were continued until November 1958.

At that time the Atlas and the Titan vehicles appeared to offer more promise as ICBMs. An early version of the Navaho rocket engine found its way into the Redstone missile and modified versions of the more powerful Navaho G-38 rocket engine powered the Atlas, Jupiter and Thor missiles. In mid-1958, NAA Rocketdyne initiated preliminary design of a liquid fueled rocket engine, the F1, which had the potential of producing 1.5 million lbs. of thrust. Later in 1958 and in early 1959 NASA signed contracts with Rocketdyne for the design/development of the H-1 and F-1 engines. In the same time frame, NASA negotiated a contract with NAA to build seven booster airframes and one low-cost launcher, the Little Joe Launch Vehicle, to test the escape system and heat shield for the manned Mercury spacecraft.

To culminate a great decade for NAA, test pilot Scott Crossfield in 1959 initiated the X-15 test flights. The X-15 set speed and altitude records in the early 1960s reaching the edge of outer space and returning with valuable data subsequently used in NAA aircraft and spacecraft design. The work performed on



Bill Edson Photo

A Navaho is launched from Cape Canaveral in 1957.



NASA GRIN Photo

The Little Joe Launch Vehicle was used to test the escape system and heat shield for the Mercury spacecraft.

the Navaho and Hound Dog missile projects, on the development of missile and rocket systems at Rocketdyne and on the X-15 and XB-70 and other aircraft programs at LAD in the 1950s provided NAA with a firm foundation to support entry into future manned spacecraft projects.

United States Enters Space Race

The Space Race was a competition of space exploration between the Soviet Union and the United States, which lasted roughly from 1957 to 1975. It was a significant driver that stimulated the thoughts of exploration of outer space with artificial satellites, and of possibly sending humans into space and of landing them on the moon. The Space Race effectively began after the Soviet launch of Sputnik I on October 4, 1957. The term originated as an analogy to the arms race. The Space Race became an important part of the cultural, technological and ideological rivalry between the United States and the Soviet Union.

During the Cold War, mid-1940s to early 1990s, space technology became of specific significance because of the potential military applications implied and the morale boosting social benefits to be gained by the winner. By the late 1950s and early 1960s successful space launches occurred regularly, although periodically we had to deal with adversity. In the early days, however, it wasn't at all unusual for us to have launch aborts, explosions and/or failures on the "Cape". Some of the explosions were devastating and caused serious damage to the flight and ground system hardware and resultant delay or cancellations to the program involved.

As time progressed, DOD launches of their missile systems became commonplace. Operational Thor and Jupiter Intermediate Range Ballistic Missiles (IRBMs) were deployed in the United Kingdom and in Europe and Atlas Intercontinental Ballistic Missiles (ICBMs) within the United States. The U.S. space programs had to, and did react to the external environment of the Cold War, the Space Race and the Cuban Missile Crisis impacted our everyday lives.

In late 1957, the first successful test flight of an ICBM by the Russian R-7 rocket was demonstrated and on Sputnik II, the first dog (Laika) was successfully launched into space. In mid-1958, pre-Mercury capsule competitive study contracts were let to NAA and to GE.

In the latter half of 1958, the National Aeronautics and Space Act was signed to authorize the establishment of the National Aeronautics and Space Administration (NASA). With that decision, NASA was officially constituted and charged with responsibility for the U.S. civilian space program. The National Advisory Committee for Aeronautics (NACA) was dissolved and its assets and personnel were transferred to NASA. Just six days after NASA began operation, the first American human space flight program, Project Mercury, was initiated.

The goals of the program were strictly defined as 1) Orbit a manned spacecraft around the earth, 2) Investigate man's ability to function in space, and 3) Recover both man and spacecraft safely. The first home of Project Mercury was at NACA's Langley Aeronautical Laboratory (later to become the Langley Research Center) in Hampton Virginia. Of major significance is the fact that most of the initial leadership of NASA and of Project Mercury and later of Projects Gemini and Apollo were Langley managers and engineers. Until the advent of NASA, the Langley lab was not known to many outside the aerospace community.

The major contributions that Langley made to the Mercury Project included the development of the Mercury capsule design concept, test and launch of the Mercury capsule, provision of the instrumentation and tracking capability of the capsule and the training of the astronauts who flew it. After President Eisenhower delegated authority for the country's manned space program to the National Aeronautics and Space Administration (NASA), the first NASA administrator T. Keith Glennan, assigned the working level responsibility to Langley's assistant director Robert Gilruth.

Gilruth then asked a small group of designers/engineers from the Pilotless Aircraft Reseach Division (PARD) at Langley to step up their studies of ballistic-shaped spacecraft. In late 1958, Gilruth gathered many of the resources from within PARD to form the Space Task Group (STG). It was this group that was initially identified to implement and manage manned spacecraft/satellite projects for NASA. The Mercury project was the first phase of NASA's manned space program.

To be continued as Part 2 in the Spring 2010 Issue

About the author: After his discharge from the U.S. Marine Corps in 1954 Bill entered Northeastern University as a co-op program student majoring in electrical engineering. His co-op job took him to the MIT Instrumentation Laboratory. Receiving his degree in 1959, he remained on the staff at MIT until he came to NAA in 1962. During his 34 years with NAA/Rockwell, he has served on the Apollo, Space Shuttle and Space Station programs in a supervisory or management position. Half of that time was dedicated to launch operations on Apollo and Space Shuttle at KSC. Since his retirement in 1996, he has served as an aerospace consultant. Bill currently resides in Newbury Park, California with his wondrous wife of 53 years, Penny.

Contrails From The Past

by Ed Rusinek

Dear Ed,

I have just read in the Fall Issue regarding a possible relocation site for your headquarters - how much space do you need? I may be able to provide you the space here in Fullerton.

—Pete Magoski, Fullerton, CA

Ed's Ans.: From necessity, we have learned to operate by computer and we virtually only meet once a year at the Bald Eagle luncheon. However, thank you Pete for your most generous and, as always, thoughtful offer.

Dear Ed,

As usual, an outstanding bulletin. Having suffered through both Orbiter losses, I found the article on *Columbia* an excellent presentation although painful to read because of the emotions it brought back. We at NAA/Rockwell should feel proud of the accomplishments of the Orbiter and the SSME. None of our high technology systems ever caused the loss of a mission or a life. The losses came from the low technology solid motors and foam insulation coupled with the incredibly naïve risk management of NASA operations. They treat every nonconformance as a maintenance problem, an approach that makes no sense for single use components like the SRB's and External Tanks.

—Stephen Evans, Foothill Ranch, CA

Ed's Ans.: Having been there through the Apollo 1 fire and the loss of Challenger *and* Columbia*, the question never leaves you. Could we have done something, anything, that would have prevented these things from happening? The feeling is the price we pay for the poor decisions of others!*

Dear Ed,

I am renewing my subscription with the enclosed check for $15. If you decide that the renewal fee should be $20, I will make up the difference. The Bulletin is worth it!

—Edgar Jones, Penn Valley, CA

Ed's Ans.: It's responses like yours that make all the work we put into the Bulletin worthwhile. Of course, I would expect nothing less from another Ed!

Dear Ed,

I enjoyed reading Larry Korb's article on the *Columbia* investigation. I was another retiree brought back to KSC to work on the post-accident investigation and remember getting the late Sam Kreidel to come down and help us. He immediately had NASA build three-dimensional frames to locate and support the recovered fragments of the left wing leading edge as they were identified and then, in typical Kreidel fashion, produced a beautifully drawn isometric drawing showing all these parts, his determination of where the failure area was and the derived plasma flow pattern into the wing. It all tied in with the findings of the other teams that Larry described in his article and supported the eventual conclusions in the CAIB Report.

—John Tribe, Merritt Island, FL

Ed's Ans.: Sam was a brilliant engineer. My biggest regret is that I couldn't get him to subscribe much less write an article for the Bulletin.

Dear Ed,

Absolutely! Increase the price. Each issue I receive warms my heart just to see that NAA symbol.

—Vera Lusher-Clodius, Anaheim, CA

Ed's Ans.: Bravo, Vera! You are the type of person we write for, one with life and vivid memories of who we once were.

Dear Ed,

Larry Korb, my M & P Engineering boss for many years, did a masterful job on his article. I also loved the Shuttle "Piggy Back" story by "Triple" Nickel. I haven't read the Rocketdyne story yet but it looks like another good one!

I would have paid $15.00 for the Fall 2009 issue alone, but I am enclosing a check for $100.00 to become a Silver Eagle. Thank you for your effort.

—Curtis Brownfield, Rancho Palos Verdes, CA

Ed's Ans.: On behalf of our authors, I thank you for your kind words. On behalf of the Bulletin, I thank you for your kind of check!

Dear Ed,

I believe a subscription rate of $15.00 is justified. At 90, I may be in the Silent Majority but I am not ready yet.

In 1942, my wife and I came to California from New York to join the war effort. Lockheed said "No" because I was draft bait. So I went to the government employment office in downtown L.A. While there, a man came in and talked to the clerk who looked in our direction and pointed to the three of us sitting there. The man came over and told us to report to North American on Monday morning and left.

I went over to the clerk and asked, "What's North American?" He answered, "North American Aviation, the maker of the P-51 and the B-25." I asked where was it located and he answered, "Mines Field." I asked, "Where is that?" He explained and I reported Monday morning.

I was hired as a production control clerk in the machine shop at 60¢ per hour plus 6¢ night bonus. After 35 years and a stint in the Navy in the South Pacific, I retired from Rocketdyne as a purchasing supervisor and a Bald Eagle.

—John Gejer, Hawthorne, CA

Ed's Ans.: When we speak of the NAA Family, we are talking about people like you John. Your wife, Margaret added a little note that when you came back after two years in the Service, NAA had a job waiting for you. And keep moving John, make it hard for the Devil to find you!

Dear Ed,

I've enclosed a check for $30.00 for two years of the Bulletin, whether you increase the subscription price or not. The Bulletin is worth every penny to me.

I graduated from Warwood High School, a suburb of Wheeling, West Virginia, in 1951. A classmate of mine was a girl named Joanne Lujan who would occasionally mention her uncle who owned an airplane factory in California. His name was Kindelberger. Little did I realize that years later I would be working for him in Inglewood.

—Wayne Millard, Orange, CA

Ed's Ans.: If you were living in West Virginia in 1951; for all practical purposes, California seemed as far away as the Moon! I started in Downey in February 1951. Dutch would periodically come unannounced and as he walked down the aisle in Engineering, the room would hush up. Even if you didn't recognize him, you realized that he was the MAN! If he hadn't died when he did, NAA would still be the greatest aerospace company in existence!

Congratulations and Best Wishes to

Gardner and Patricia James
of Brentwood, California celebrating their
60th Wedding Anniversary

Don and Ann Walker
of Dewey, Arizona celebrating their
60th Wedding Anniversary

Clay and Kathy Carlson
of Torrance, California celebrating their
50th Wedding Anniversary

Grow old along with me!
The best is yet to be.
– Robert Browning

New Subscription Rate For 2010 Is $15

When we announced that we are probably going to raise the subscription rate for 2010, several of you subscribers sent in $10.00 renewals and gift subscriptions. We apologize for the inconvenience but we must insist that payment for all subscriptions be $15.00 per year renewed. Therefore, we ask that all of you that have sent in a $10.00 subscription per year renewed, send in the additional $5.00 per year renewed. To minimize the confusion, we have added an asterisk to all those who have sent in the $10.00 subscription fees.

Look at your name and address on the back page.

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The Silent Majority

by Stan Guzy



O'MALLEY, THOMAS "T.J.", 94 – passed away on November 7, 2009 in Cocoa Beach, FL after a brief battle with prostate cancer. Tom was in charge of the Mercury team that launched John Glenn. He joined NAA after the Apollo I fire and served as Director of Apollo Launch Operations from 1967 to 1969. He then served as Vice President and General Manager of Florida Operations for the Apollo and Shuttle programs from 1969 to 1981. He is survived by his loving wife of 65 years, Ann. He was a very aggressive leader and a generous friend. God be with you, Tom.



CALDEIRO, FERNANDO "FRANK", 51 – a NASA Astronaut and the first of Argentinean descent to train for space flight, died on October 3, 2009 in Houston, TX after a two-year battle with brain cancer. After obtaining an MS degree from the University of Central Florida, Frank joined Rockwell International to serve on the checkout and delivery of all 100 B-1B bombers to the USAF. In 1988, he transferred to KSC as a specialist on the Space Shuttle main propulsion system. In 1991, he joined NASA as an expert in cryogenics and propulsion systems and took part in 52 space shuttle launches before being chosen as an astronaut candidate in 1996. Although never assigned to a mission, Frank served many key roles as the lead astronaut. He is survived by his loving wife Donna Marie.

AHRENS, ALBERT L. "AL", 87 – succumbed after a long battle with prostate cancer at home in Westminster, CA on July 19, 2009. Al joined NAA in July 1945 after serving on the *USS Guadalcanal* during World War II as a Navy pilot. He was assigned to several programs including the F-86, B-70, B-1 and the Space Shuttle in Downey. He retired from Space Division in 1982 with more than 36 years of service. He is survived by his loving wife Nell.

BARKER, PAUL, 72 – died September 18, 2009 in Waikoloa, HI. Paul started in Downey as a subcontract administrator on the Apollo and Saturn programs and was promoted to manager on the Space Shuttle. In 1974, he transferred to the Satellite Systems Division at Seal Beach as a director, then returned to Downey as director of Central Procurement. He subsequently transferred to the B-1 Division as a Materials director and left Rockwell in 1988 with 23 years of service. He is survived by his wife Francine.

BLAIR, THOMAS A. "TOM", 87 – passed away on October 1, 2009 in Port Angeles, WA. Tom retired in 1982 as a Manufacturing manager on the Apollo and Shuttle programs in 1982 after 36 years of service. He is survived by his loving wife of 54 years, Rosalie.

CAMPBELL, GERALD J., 80 – passed away at home from undisclosed causes. He was a shop manager when he retired after 26 years of service. He is survived by his loving wife of 59 years, Charlene.

CRABTREE, FRANCIS W., 91 – passed away in Hemet, CA on August 26, 2009. Francis served in the Philippines during World War II and joined Rockwell where he served on the guidance system for the Apollo program. Burial took place at the Riverside National Cemetery.

DUNEER, ARTHUR G., JR., PhD., 84 – succumbed to a combination of pneumonia and pulmonary embolism on August 15, 2009. He graduated from Rensselaer Polytechnic Institute with a B.S. in Physics and later returned to earn a doctorate in Nuclear Physics. In 1964, he joined NAA to work on the re-entry shielding for the Apollo space modules. He later transferred to the Autonetics Anti-Missile Division where he worked until he retired in 1987. He is survived by his wife of 58 years, Lillian.

FLATTEN, ORRIS H., 85 – of Durango, CO died peacefully on October 13, 2009 in Newport Beach, CA. Orris joined Autonetics in 1952 after earning an M.S. degree in Electrical Engineering and specialized in the design of guidance systems. In addition to having numerous patents on guidance system components, Orris also invented and had patented the infusion pump for intravenous machines now used in hospitals worldwide. He retired in 1981 with 28 years of service. He is survived by his wife of 54 years, Ann.

GILLESPIE, THOMAS L., 78 – passed away peacefully on September 10, 2009 at St. Joseph Hospital in Orange, CA surrounded by his family. Tom's career at NAA/RI spanned 34 years when he retired as an Employee Practices Manager in 1990. He is survived by his wife Beverly.

GRAN, KENNETH G., 92 – passed away at his home in Seal Beach, CA on November 7, 2009. After serving in the U.S. Army Air Corps, Ken accepted a position with NAA as a manager. He was a Shuttle Launch Honoree in 1982 and retired in 1983 after 35 years of service.

HALL, MARY M., 81 – passed away on August 22, 2009 in Pahrump, NV. Mary retired from the Tulsa Division in1983 with over 31 years of service. She started as an assembler at the Columbus Division in February 1952 and advanced in positions to electrician, production control, purchasing and departmental clerk. One of her thrilling moments was to see the first F-100 built at Columbus perform its maiden flight. She later was transferred to the Tulsa Division. Her husband, George, also served at both plants and preceded her in death in 1998. Spunky Mary wrote this obituary just before she died. God Bless you Mary!

HOLLAND, WILLIS L., 92 – died at his home in Orange, CA on September 24, 2009 from undisclosed causes. He served at NAA/RI for 42 years when he retired. He is survived by his wife of 69 years, Zelma.

KEITH, MARK, 87 – of Nipomo, CA passed away on September 6, 2009 surrounded by his family. Mark started at NAA in 1941 in the blueprint department and ultimately became the Director of Data Services. He was recognized nationally as an expert in his field when he retired in 1984. He is survived by his loving wife of 61 years, Dolores.

KELLY, TED J., 90 – of San Dimas, CA died on July 14, 2009 after a long illness. He was the L&T planning supervisor in Downey on the Hound Dog, Apollo, and Shuttle programs when he retired with 37 years of service. He is survived by his wife Jeannette.

KEMPER, EDWARD "ED", 89 – passed away in his sleep

on October 20, 2009 in Elk Grove, CA. Ed retired as a project manager from the B-1 Division in 1979 with 36 years of service. He is survived by his wife of 63 years, Lillian.

LANE, WILLIAM J., 72 – died peacefully in Whittier, CA on September 25, 2009. Bill served his entire career at NAA/RI/Boeing until he retired 2001. He is survived by his wife Clara.

LINCOLN, RONALD H., 78 – passed away on July 3, 2009 in Hemet, CA after a valiant battle with cancer. Ron served in many divisions and retired from the B-1 Division in 1990 after 30 years of service. He is survived by his wife Jeanne.

McKIM, CHARLES E. "CHUCK", 89 – of Clifton, CO died on August 20, 2009 at a hospice in Grand Junction surrounded by his family. During WWII, Chuck joined the Navy and his ship transported British and Canadian troops to Normandy on D-Day. In 1948, he was recalled to active duty and taught electronics at the Naval War College. He joined NAA as an electronics technician. He worked on various missile programs and culminated his career as a Post-Flight Test Engineering Technician on the Apollo Program. He was a member of the Recovery Team on the U.S. carriers that sailed out in the Pacific Ocean to recover the Apollo Command Modules after they splashed down. He retired from Space Division in 1970 with 20 years of service. Chuck is survived by his loving wife of 67 years, Mildred. We shall always remember Chuck for his booming voice, filled with a good heart.

MORAN, CORNELIUS P., 78 – died on August 20, 2009 in Fullerton, CA. He served as a lead engineer at Autonetics and Space Division. He was instrumental in the development of the first computerized on-board navigational system for the Space Shuttle. He is survived by his wife Lucille.

OPHIEM, WALLACE S., 85 – a resident of Villa Park, CA he passed away on August 16, 2009 from undisclosed causes in Mission Viejo, CA. Wallace retired from Collins Radio in 1984 after 35 years of service.

ORMSBY, RICHARD R., JR., 71 – died at his home on August 11, 2009 after a brief but valiant battle with cancer. He served for many years at NAA/RI as an electrical engineer before retiring. After retirement he became an independent computer consultant.

PARDEE, ROBERT L., 85 – of Minden, NV died in Rancho Mirage, CA on March 22, 2009. Bob served as a project engineer in Defense Electronics Ops for 29 years when he retired in 1985. He is survived by his wife Antoinette "Toni" who is also a retiree.

PINTO, JOE, 89 – of Camarillo, CA passed away on September 7, 2009. Joe served on the Apollo and Space Shuttle programs for 37 years and retired as a supervisor in Planning in 1984.

ROWELL, GEORGETTE, 84 – of Brea, CA passed away on April 29, 2009 of heart failure. She started at LAD, then Downey and finally at Seal Beach. In Program Planning & Control she supported the Saturn II, P80 Satellite, and Teal Ruby programs. She retired in 1990 with more than 30 years of service.

SHARP, JAMES R., 67 – of Crooked River, OR passed away on July 28, 2009. He served at Space Division and Seal Beach in Property Management for 12 years. He is survived by his wife Mary.

SILVA, HERMAN A., 95 – died from undisclosed causes on September 16, 2009 in Santa Ana, CA. He retired from NAA/RI in 1980. He lost his beloved wife, Molly, in 1987 after 50 years of marriage.

SNIDER, WILLIAM M., 88 – passed away in Apple Valley, CA on June 26, 2009 of cancer. Bill served for 32 years at Rocketdyne, LAD, Palmdale, and Space Division when he retired in 1979. He is survived by his loving wife of 60 years Helen.

STRONG, PERRY J., 77 – died on August 22, 2009 from undisclosed causes. Perry served his entire career at NAA/RI until he retired in 1995. He is survived by his wife Patricia.

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North American Aviation Retirees Bulletin

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Photo from the John Lambert Collection

The pilot of a P-51D-20 Mustang of the 46th Squadron, 21st Fighter Group, loaded with 110 gallon auxiliary fuel tanks, awaits the signal to start engine and taxi to begin a B-29 escort mission from the captured airfield on Iwo Jima. To conserve fuel for these very long range missions, the Mustangs' engines were not turned over until the last minute. Mount Suribachi, scene of the iconic Marine flag raising, rises in the background.

North American Aviation Retirees Bulletin

"Where The Best Never Rest"

Spring 2010

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NAA AT CAPE CANAVERAL AND KSC – PART II by Bill Edson

THE PRODUCTION DEVELOPMENT LABORATORY STORY by Jim Hurzeler

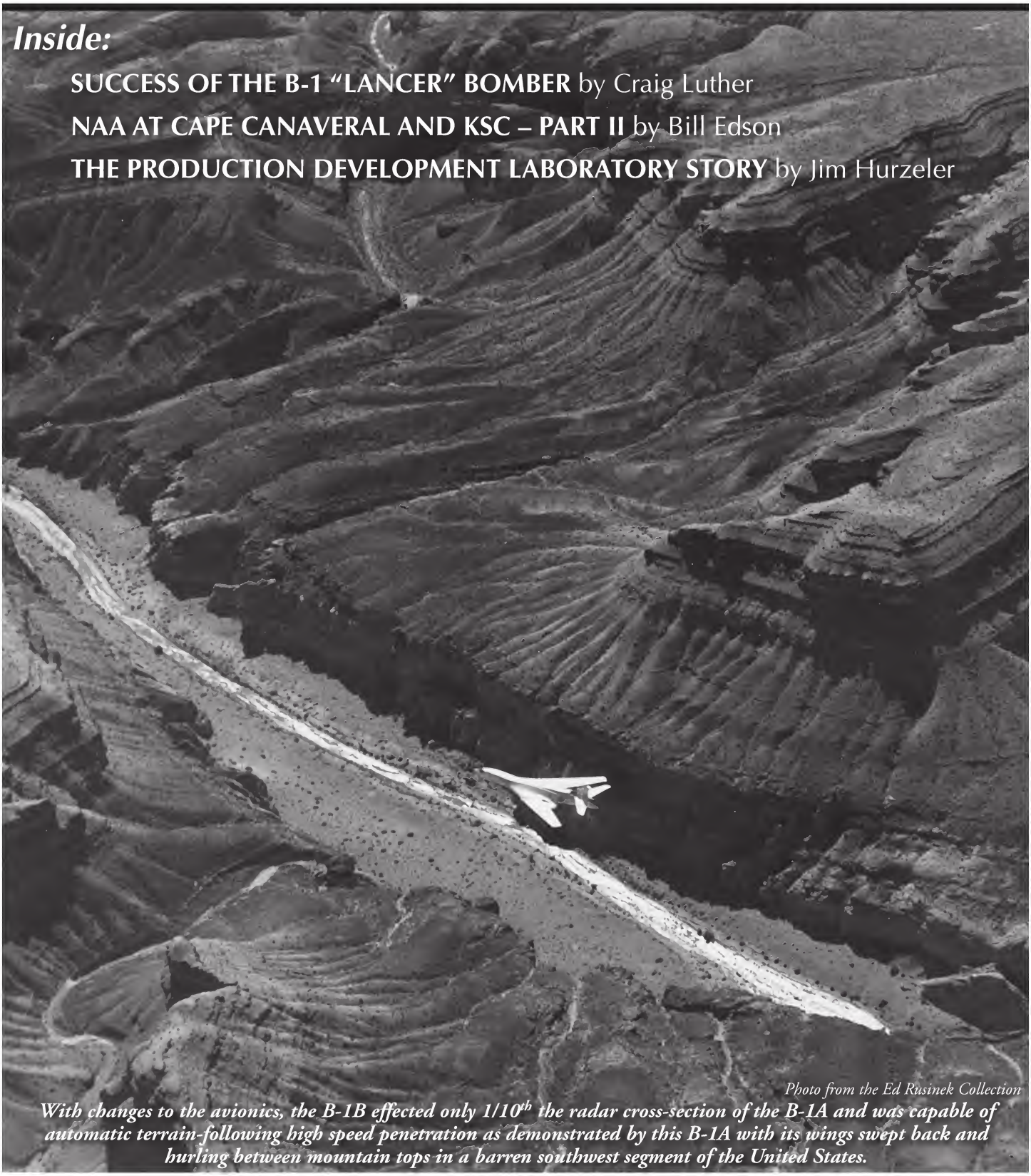


Photo from the Ed Rusinek Collection

With changes to the avionics, the B-1B effected only 1/10th the radar cross-section of the B-1A and was capable of automatic terrain-following high speed penetration as demonstrated by this B-1A with its wings swept back and hurling between mountain tops in a barren southwest segment of the United States.

NORTH AMERICAN AVIATION
Retirees Bulletin

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Dear NAA Retirees Bulletin Subscriber

We have been heartened and moved by the many kind letters that you readers have sent us with your subscription renewals. Lila Luv sent in her renewal check with a note of apology. She did not want to cut out her renewal form because it would ruin the P-51 cover. God Bless her! As a teenager, she worked on the P-51 production line along with her sister on the B-25 line. So many of you mentioned the quality and depth of the articles and others how they reminded them of their own experiences while serving at NAA/Rockwell. For that, we can thank our splendid authors! Sadly, our total number of subscribers is down because the Silent Majority and old age have been particularly harsh this past year on our many friends and colleagues. But we shall carry on! After all, we are the North American Aviation family.

With the new year, we bring you something old and something new. Bill Edson continues with the second segment of the North American Aviation/Rockwell activities at the Kennedy Space Center. In this issue, he writes about the steps that led to the Apollo Program. He tells of the gradual buildup of Cape Canaveral and the initial launches of man in space with the Mercury and the Gemini which precluded the Apollo race to the moon!

When we think of NAA Engineering of past years, we visualize row on row of drafting tables backed by rows of desks and engineers with tee-squares and slide rules. Rarely, do we remember the boys in the back room! These were the engineers, chemists, metallurgists, lab technicians, mechanics, tinkerers, and inspectors in the laboratories, on the test stands and in the field. When the blueprints were complete and approved, these were the folks that helped transfer what was on paper into wonderful realities. The author, Jim Hurzler, is an old hand in the laboratory and this is his salute to his old shop mates and lab hands. Many of the names you will recognize. We added our salute to these heroes of the "back room".

Our guest historian from Edwards Air Force Base, Dr. Craig Luther, is back with his second report on North American Aviation vehicles being tested and flown at Edwards. His subject airplane is so timely because in April we have Major Scott Higgenbotham as the guest speaker discussing his experiences, flying missions over Iraq and Afghanistan in the B-1B "Lancer". After you read this article, make it a point to come to the Bald Eagles 48th Reunion. Better yet, get a group together and carpool to the luncheon. Major Higgenbotham spoke at the B-1 Reunion to a standing ovation and there wasn't a dry eye in the place!

Reminder: If your name on the address label still has December 2010*, your resubscription payment still lacks the $5.00 required to make up the $15.00. Please remit and save us the extra effort expended to keep this on our books! If you don't comply soon, we have been assured by Sonnie that you will get a nasty reminder! You don't want to go there!

Success of the B-1 "Lancer" Bomber

by Craig Luther, Ph.D.

Although the North American/Rockwell B-1 "Lancer" almost failed to make it into production, its development, manufacture and eventual deployment above the skies of Afghanistan and Iraq signified the bomber's ultimate vindication as a vital component of American's military might. The weapon system's history reaches back to the early 1960s, when the Department of Defense (DOD) began a series of studies which established the requirement for a low-altitude penetration bomber to replace the Boeing B-52. These studies resulted in the June 1970 selection of a proposal by North American/Rockwell to meet the Air Force requirement for an Advanced Manned Strategic Aircraft (AMSA). Plans to order five prototypes of the B-1, as the new bomber was christened, were soon modified in a cost-cutting initiative which eliminated two of the flying prototypes, as well as one static test asset. Later, one of the prototypes was restored, which enabled work to proceed on four aircraft, while production planning called for 240 operational B-1s. The four prototypes were later designated B-1As.

The design of the bomber incorporated a blended wing and body configuration, while the wings evinced a cantilever, low-wing, blended wing-body structure, with variable geometry on the outer panels. The primary materials employed in the construction of the B-1 were aluminum alloys and titanium, the latter used mainly in the wing carry-through structure, engine nacelles, and in the aircraft's fuselage. The remainder of the airframe was composed of steel and a number of non-metallic materials. The B-1 was powered by four General Electric (GE) YF101-GE-100 turbofan engines, each rated at about 17,000 pounds of static thrust dry and 30,000 pounds with afterburner. The engines were mounted in pairs beneath the fixed center section of the wing close to the center of gravity, offering the greatest stability in low-altitude turbulent conditions.

This long-range strategic bomber was designed to operate at treetop level at near-sonic speeds and at supersonic speeds (Mach 2.2) at high altitude. The concept of operations envisaged the bomber penetrating defended enemy airspace to deliver either nuclear or conventional weapons. The bomber had a radar signature equal to about 5% of that of the already aging B-52; moreover, the B-1A was to carry twice the payload and make use of shorter runways. In other words, the new bomber promised to be a major addition to America's Cold War arsenal.

Assembly of the B-1A prototypes took place in Air Force facilities at Palmdale, California, beginning late in 1972. Some two years later on 26 October 1974, the first aircraft (S/N 71-40158), rolled out of Rockwell's final assembly plant at Palmdale – an event which received broad national television and print coverage. Low-speed taxi tests followed in late November, with high-speed taxi tests conducted in December.

These initial ground test activities culminated in the first flight of the initial B-1 prototype on 23 December 1974. While the nation looked on (the event was televised throughout the country), at 10:30 in the morning the aircraft—with chief Rockwell test pilot Charles C. Bock at the controls—eased off the runway at Palmdale and flew to Edwards Air Force Base in a mission lasting about one hour and 20 minutes and covering slightly more than 250 miles. The objective of this maiden flight was to evaluate the sleek bomber's handling characteristics at low speeds while putting it through a series of gentle maneuvers with the landing gear, flaps and slats extended and the swing wings in the full forward position. During the flight the aircraft attained a top speed of 190 knots and a top altitude of 10,000 feet. The flight was a near total success.

The second and third prototypes took to the skies in 1976 (No. 2 on 14 June and No. 3 on 1 April). However, in June 1977, the B-1 production program was cancelled by the new Democratic President, Jimmy Carter. Yet with research and development flying allowed to continue at Edwards AFB, in October 1978 the bomber demonstrated its ability to fly at Mach 2.2. The fourth and final prototype flew for the first time on 14 February 1979. The flight program came to an end on 29 April 1981, by which time the four test aircraft had accumulated 1,895 hours of testing.

Despite cancellation of the B-1A program, interest in a new long-range manned bomber quickly re-emerged and a variant of the original B-1 design was championed to meet ongoing USAF requirements for such a weapon system. Indeed, the inclusion of a new long-range bomber in the triad of nuclear forces (along with ground-launched and submarine-launched nuclear-tipped ballistic missiles) became one of the key national defense planks advocated by Ronald Reagan during the presidential campaign in 1981. Following Reagan's election, on 2 October 1981, the new administration announced plans to



build 100 B-1 bombers, now designated "B-1Bs." As a result of this decision, two of the four B-1A prototypes were brought into the B-1B development program.

As explained by the Federation of American Scientists, the differences between the B-1B and its predecessor were "subtle yet significant." Externally, the differences included a simplified engine inlet and a modified over-wing fairing. Less evident changes were a window for the offensive and defensive systems officer's station and engine housing modifications which reduced exposure to hostile radar. The B-1B also boasted an increased gross takeoff weight capacity of 477,000 pounds in comparison to 395,000 pounds for the B-1A—yet the empty weight of the B-1B was only 3% greater than that of the B-1A. This added takeoff weight, along with a moveable bulkhead between the forward and intermediate weapons bays, enabled the B-1B to carry a wide range of nuclear and conventional munitions. However, the most vital changes were in the avionics, with a lower radar cross section (about 1/10th that of the B-1A), automatic terrain-following high speed penetration, and precise weapons delivery. Finally, the Reagan administration's B-1B retained the GE F101 engines, albeit in an improved variant.

While few external differences distinguished the B-1B from its predecessor, the new bomber's operational concept was radically different. In contrast to the mission envisaged for the B-1A, the B-1B was to function mainly as a cruise missile carrier-launching its missiles at a considerable distance from the target, perhaps even outside the enemy's ring of defenses. Perforce, less emphasis was placed on supersonic performance, with the maximum speed throttled back to Mach 1.25. To perform its new mission, the B-1B was outfitted with external hard points for missiles, bombs, or fuel tanks.

Conducted by the B-1B Combined Test Force (CTF) at Edwards AFB, the B-1B flight test effort got officially underway on 23 March 1983, with the modified B-1A No. 2 serving as the test aircraft†. On board for this "first flight"†† were T.D. "Doug" Benefield as pilot; Lt. Col. Leroy B. Schorder, CTF director, as co-pilot; and James A. Leasure as flight test engineer. Both Benefield and Leasure were Rockwell personnel. Although the primary goal of this first flight was functional checkout, a number of test points were also completed. For example, low pressure weapons bay vibration and acoustic runs were conducted and handling qualities evaluated while flying behind a KC-135 tanker; dry aerial refueling hookups were also executed. Conversely, scheduled flying qualities tests were cancelled after the No. 1 engine vibration light came on shortly after takeoff, forcing the engine to be placed in idle for the remainder of the flight. Following 3.4 hours in the air, the aircraft touched down at Edwards AFB.



U.S. Air Force Photo

In the weeks and months that followed, the B-1B flight test program remained on track, averaging about one flight per week through September 1984. On 30 July 1984, B-1A No. 4 S/N 76-0174 flew for the first time since being modified with full B-1B offensive and defensive avionics systems. Sadly, the program suffered a grievous setback on 29 August 1984, when B-1A No. 2 was lost to an accident while undergoing minimum control airspeed tests in the Cords Road test area northeast of Edwards AFB. Killed in the mishap was test pilot Benefield, whose ejection module recovery parachute malfunctioned. Seriously injured was Major Richard V. Reynolds (later commander of the Air Force Flight Test Center from 1998-2001) and Captain Otto J. Waniczek, the flight test engineer. Cause of the accident was determined to be pilot error.

Built to production standards, the first purpose-built B-1B S/N 82-0001 flew from Palmdale to Edwards on 18 October 1984. The crew consisted of: M.L. Evenson, pilot; Lt. Col. B. Schroeder, co-pilot; Captain D.E. Hamilton, Defensive Systems Officer (DSO); and Major S.A. Henry, Offensive Systems Officer (OSO). This first flight progressed smoothly, the aircraft lifting off from Palmdale at 2:38 p.m. PDT and staying aloft for 3 hours 20 minutes before touching down at Edwards AFB. Primary objectives were to evaluate flying qualities and assess inflight operation of the avionics systems. As noted in the flight test report, "the crew were very pleased with the overall avionics performance during the 3.3 hour flight." Following the flight, this first B-1B was permanently assigned as a test article to the B-1B CTF at Edwards. The second purpose-built (production) B-1B flew for the first time on 4 May 1985.

Induction of the B-1B into the bomber inventory of Strategic Air Command (SAC) began in the summer of 1985, when B-1B S/N 83-0065, *The Star of Abilene* was delivered to Dyess AFB, Texas. At Dyess, the 337th Bombardment Squadron of the 96th Bomb Wing received the first 15 B-1Bs, with initial operational capability (IOC) achieved on 1 October 1986. The production run of 100 aircraft ended in 1988, with the final production B-1B delivered to the 384th Bomb Wing at McConnell AFB, Kansas, in May 1988.

While originally conceived as a long-range strategic bomber (and an integral component of the USAF's nuclear war fighting plan), the B-1B underwent many modifications in the years that followed, while also overcoming problems with its defensive avionics systems. For example, the Conventional Mission Upgrade Program, or CMUP, enabled the bomber to perform as a platform for delivery of a wide array of conventional weapons (precision and non-precision). According to the official Air Force B-1B "fact sheet" (current as of December 2009) conventional armaments include: 84 500-pound Mk-82 or 24 2,000-pound Mk-84 general purpose bombs; up to 84 500-pound Mk-62 or eight 2,000-pound Mk-65 Quick Strike naval mines; 30 cluster munitions (CBU-87, -89, -97) or 30 Wind-Corrected Munitions Dispensers (CBU-103, -104, -105); up to 24 2,000-pound GBU-31 or dozens of 500-pound GBU-38 Joint Direct Attack Munitions (JDAM); and up to 24 AGM-158A Joint Air-to-Surface Standoff Missiles (JASSM).

Although disparaged by some as a luxury America can no longer afford—given the demise of the Soviet Union and her eastern bloc allies by 1991—the B-1B has proven itself to be an indispensible adjunct to our nation's war fighting capabilities. As the backbone of the USAF's long-range bomber force, the



B-1B first saw combat in support of operations against Saddam Hussein's Iraq during Operation Desert Fox in December 1998. Since that time the bomber has performed successfully in a conventional role during Operation Allied Force (1999), Operation Enduring Freedom (OEF, from October 2001) and Operation Iraqi Freedom (OIF, from March 2003).

In fact, the B-1B has recorded a remarkable combat history. The bomber established an unparalleled record over the Balkans in 1999 which may be unsurpassed in history—it completed 100 of 100 combat missions and took off on time 100 percent of the time. Just six B-1Bs dropped over 20 percent of the total ordnance (over 2,500,000 pounds of munitions), while flying less than two percent of the total sorties. During the first six months of Operation Enduring Freedom (ca. October 2001 - April 2002), eight B-1Bs dropped about 40% of the total tonnage delivered by coalition air forces over Afghanistan, a figure which included nearly 3,900 JDAMs, or 67% of the total.

Major Scott Higginbotham, currently the B-1B Test Director for the AFOTEC's (Air Force Operational Test and Evaluation Center) Detachment 5 at Edwards AFB, offers this graphic description of his 58 combat missions (in five tours of duty!) over Afghanistan: *"In the four years immediately following 9/11, I deployed four times with the 9th Bomb Squadron in support of OEF/OIF. Our typical loadout at the time was a full complement of 24 2,000-lb JDAMs, with fuse settings ranging from airburst to longer delays for penetrating structures or caves. The standard mission durations were 14-16 hours involving multiple air refuelings, with 4-6 hours over country to provide on-call firepower for coalition ground forces. With few exceptions, we rarely took off with pre-planned targets but would receive targets while airborne from the CAOC (Combined Air Operations Center) over satellite communications (SATCOM) or from a controller on the ground over secure radio. The recent upgrades in GPS guided weapons capabilities and secure communications were essential in allowing us to transition from a Cold-War era penetrating strategic bomber to a responsive, persistent tactical strike platform as well.*

"Since 2005, I have been assigned to operational test for the B-1 and have been involved in upgrades such as the GBU-38 500-lb JDAM and the Sniper targeting pod. This past year, I deployed for the fifth time and had the opportunity to witness first-hand the continuing evolution of the B-1's combat capabilities thanks to these recent upgrades. The targeting pod gives the B-1 crews true PID (Positive Identification) capability and greatly enhances the co-ordination with controllers on the ground, while the GBU-38 gives them more options with respect to desired weapons effects and minimizing collateral damage and danger to friendly troops. Future enhancements to avionics, including glass-cockpit and datalink upgrades, will continue to make the B-1 viable as a strategic bomber and a tactical striker in support of ground forces."

In Operation Iraqi Freedom, 10 B-1Bs belonging to the 405th Air Expeditionary Wing (AEW) dropped 2,159 JDAMs, fully 43% of the total used in the air campaign (as of April 2005). The 213 sorties flown by the 405 AEW B-1Bs amounted to just one percent of the sorties flown by coalition air forces, yet they eliminated 10% of the targets†††. Today, B-1B bombers continue to roam the skies above Afghanistan—or wherever they may be needed—as a critical component of America's combat power in the ongoing war against Islamo-Fascism.



U.S. Air Force Photo



U.S. Air Force Photo

Notes:

† B-1A No. 2 had undergone an extensive modification program to prepare for testing in the B-1B test program.

†† This was actually the 61st flight of B-1A No. 2. The flight had been preceded by taxi tests, which were successfully completed on 18 March 1983.

††† As explained in Air Force Magazine, "success on this scale was possible because the B-1B was able to change its mission planning from the traditional scripted approach to a far more flexible one that operated under special instructions that made the best use of its long loiter time. Crews could launch with the latest intelligence and communications information, be assigned specific targets in the air and then organize ad hoc aircraft force packages as required." (AFM, April 2005, p 45)

About the Author: Dr. Luther was a Fulbright scholar in Germany. He received his Ph.D. from UC Santa Barbara in 1987. He has written several books on German military history and has served as USAF historian since 1984. His first assignment was at McClellan AFB. Since 2000, he has been an Air Force Flight Test Center historian at Edwards AFB.

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NAA at Cape Canaveral and KSC – Part II

by Bill Edson

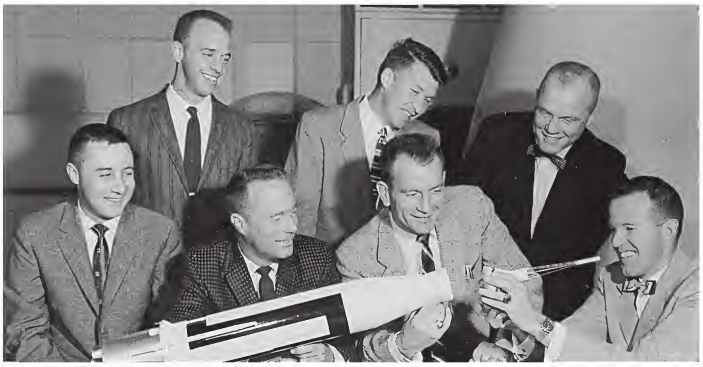
U.S. Enters the Space Race

The Chrysler Corporation was selected by the Army in 1952 to support their technical development of missile projects. In 1954 the contract was extended to produce the Redstone missile and was later extended to include design, development, production and launch of the Jupiter and the Saturn I and IB systems. Shortly afterwards, NASA assigned the Army Ballistic Missile Agency (ABMA) the task of developing eight Redstone type vehicles for use in the Mercury manned satellite program and McDonnell was awarded the Mercury program prime development contract.

Throughout 1959, a Langley research steering committee on Manned Space Flight performed a detailed study of advanced manned spaceflight missions while the Space Task Group (STG) met to discuss an advanced manned space flight program. While those studies were ongoing, the ABMA was given direction to develop a three-stage Saturn vehicle. Design criteria was established for the Saturn I launch complex and the first group of astronauts was selected for the manned space flight program.

In mid May 1959, two monkeys rode in the nose cone of Jupiter MRBM AM-18 to an altitude of 300 miles and a distance of 1,500 miles while withstanding 38 times the normal pull of gravity and a weightless period of about 9 minutes prior to being recovered. Their survival of speeds in excess of 10,000 miles per hour provided us with significant confidence that we could successfully put a man into space and return him safely to the earth's surface.

A master layout of the Saturn I launch complex was made available in 1959 and preliminary construction work was started on Launch Complex 34 (LC-34). In September 1959, Walt Williams, Kenneth Kleinknecht and Martin Byrnes transferred from what was to become the NASA Flight Research Center at Edwards AFB to the Space Task Group at Langley, bringing valuable operational and development experience from the highest performing manned flight vehicles then in existence. Upon joining the STG team, Walt Williams as the Associate Director of Operations joined Charles Dolan, the Associate Director of Hardware Development in support of Dr. Robert Gilruth, the Project Mercury Director. Ken Kleinknecht and Marty Burns became key members of Dr. Gilruth's technical staff throughout the Mercury Program. Other members of that Mercury STG team with whom we, North American Aviation (NAA), maintained Apollo Program interfaces included Paul Donnelly, Archie Morse, Walt Kapryan, Jake Moser, Max Faget, Al Kehlet, Bill Petynia, and Cadwell Johnson. In late 1959, the DOD decided that it had no immediate use for a large rocket and President Eisenhower announced his intention of transferring the Saturn Program to NASA. Shortly afterwards, it was recommended that all upper stages of Saturn vehicles be powered by high-energy propellant combinations of hydrogen and oxygen and that a new hydrogen engine be developed.



NASA Photo

The original Mercury Astronauts are pictured around an Atlas model. From left to right are astronauts Gus Grissom, Alan Shepard, Scott Carpenter, Wally Schirra, Deke Slayton, John Glenn, and Gordon Cooper.

By the end of the year, NASA had approved the Saturn C-1 configuration and a long-range Saturn development program. In 1960, launch pads along the Atlantic shoreline—"ICBM Row"—butted end-to-end with one another and available space for expansion was at a premium. DOD programs were rapidly expanding and NASA plans (as the launch vehicles increased in size) dictated the need for more land for launch, launch support and for safety clearance areas if their projected needs were to be met. The first Mercury-Redstone booster engine was successfully fired. NASA selected the Douglas Aircraft Company to build the second stage S-IV of the Saturn C-1. ABMA conducted the first simultaneous static firing of all eight Saturn I booster engines.

In May 1960, the Space Race was further amplified when the Soviet Union revealed that a U.S. U-2 spy plane was shot down over Soviet territory. In early 1960, the Rocketdyne Division of NAA was selected by NASA to develop a 200,000 lb thrust J-2 rocket engine. As the year, progressed a Saturn I launch schedule was identified that called for three Block 1 booster launches (later modified to four) and six two-stage Block 2 launches that would carry dummy upper stages. The Block 1 series of launches were scheduled for completion on March 28, 1963. Dr. Wernher von Braun directed Dr. Kurt Debus to add a second launch pad to Launch Complex 37 (LC-37) in the event that an "on pad" explosion rendered the launch pad unusable for any period of time. Additional funding was approved for this pad which included a larger service structure, additional ground support equipment and facilities capabilities and a more expansive blockhouse.

In July 1960, the responsibility for the Army Ordnance Missile Command (AOMC)/ABMA function, people and property was transferred to the NASA George C. Marshall Space Flight Center (MSFC) which officially opened at Redstone Arsenal on this date. In October 1960, the STG selected the Apollo Command Module (CM) design approach. In November, John F. Kennedy was elected President of the United States. In December 1960, Cuba openly aligned itself with the Soviet Union and their policies. Continuing into the 1960s the worldwide tensions became much greater. At home, the "Bay of Pigs" invasion, the U.S. economic embargo on Cuba, the apparent political alignment of Cuba and its Soviet allies which dictated a defensive buildup along the Florida coast, and the build-up/tear-down of Soviet launch facilities in Cuba (the Cuban Missile Crisis) was sufficient reason for concern. Abroad, the unknown situation in Vietnam and the construction of the Berlin Wall stunned the world and triggered much anxiety. There was much skepticism at the time as to the value of a civilian space program in view of what was happening around us.

Apollo Program – Crucial Years – Early '60s

On May 25, 1961 President John F. Kennedy gave his historic speech to Congress and the Nation proposing *"this nation should commit itself to achieving the goal before this decade is out, of landing a man on the moon and returning him safely to earth"*. At that time no single rocket was available that was capable of propelling a manned spacecraft to the moon. Multiple launches were considered to be a possibility but at a much higher cost. The Saturn I was in development but would not fly for months. Although larger than existing rockets, it would require several launches to place each of the components of a lunar spacecraft in orbit. The much larger Saturn V had not yet been designed although its powerful F-1 engine had already been developed and test fired. The goals of Project Apollo went beyond landing Americans on the moon and returning them safely to earth. They required us to establish the technology to meet other national interests in space, to achieve pre-eminence in space for the United States, to carry out a program of scientific exploration of the moon, and to develop man's capability to work in the lunar environment. As we all know, President Kennedy's challenge was accepted by the American people and by the NASA and all of its contractors. The next few years were crucial in laying the foundation from which NASA, the DOD and their contractors could uniformly start. History tells us that the Soviet leader Nikita Khrushchev and the American Presidents Dwight Eisenhower, John Kennedy, Lyndon Johnson and Richard Nixon all agreed that conquering outer space was of the utmost importance. Both the U.S. and the Soviet Union wanted to win the race to space in order to prove their scientific superiority and to show their military strength. Khrushchev wanted to show that communist technology was superior. President Kennedy wanted to beat the Soviets to the moon to disprove him. Speaking about the prospect of sending astronauts to the moon, Kennedy stated, *"No single space project in this period will be more impressive to mankind, or more important for the long-range exploration of space; and none will be as difficult or expensive to accomplish."*

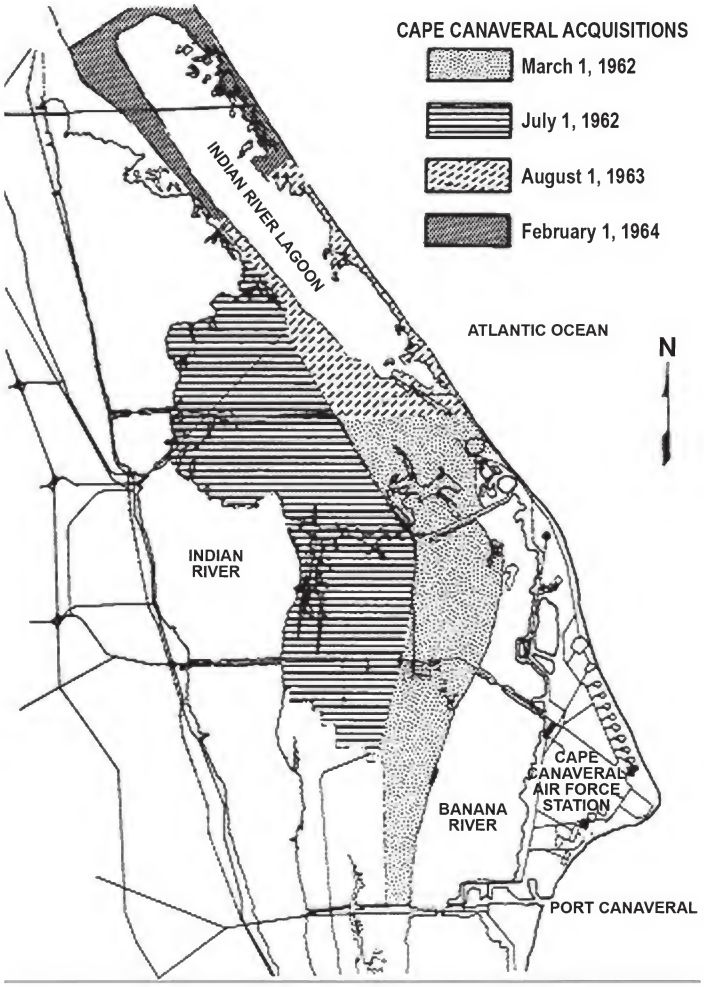


NASA Photo

President John F. Kennedy in his historic message to a joint session of the Congress, on May 25, 1961. Shown in the background are (left) Vice President Lyndon Johnson, and (right) Speaker of the House Sam T. Rayburn.

In 1961, three major programmatic decisions had to be made quickly if we were to have a chance to accomplish our objectives. A decision had not been made on the launch site. There were eight potential launch sites that were evaluated and Cape Canaveral was chosen as the launch site that best satisfied the selection criteria. On August 24, 1961, NASA announced its intent to expand the Cape Canaveral facilities to support manned lunar flight activities and other missions requiring advanced Saturn boosters. On September 5, 1961, the U.S. Congress authorized NASA to acquire the necessary land on Merritt Island. The U.S. Army Corps of Engineers, in support of NASA, initiated the procurement of land. By mid-1964, NASA had acquired all the land presently within the Merritt Island launch area.

The second significant unknown was the configuration of the launch vehicle that would carry the Apollo spacecraft to the moon. A multitude of different configurations were studied over the ensuing months. On January 10, 1962, NASA announced that it would develop a new rocket, much larger than any previously attempted. It would have a ground stage thrust of 7.5 million pounds—five times that of the Saturn I. It would be capable of placing more than 120 tons into earth orbit. This larger vehicle would have two upper stages, a S-II second stage and a S-IVB third stage, both of which would use the new J-2



NASA illustration

In August 1961, the U.S. Congress authorized NASA to acquire the necessary land on Merritt Island to accomodate a launch site. The map shows the land at Cape Canaveral acquired from 1962-1964.

engines. The S-IVB stage would be an adaptation of the S-IV stage already developed for the Saturn I launch vehicle. Design and construction plans for this new rocket, formally identified as the Saturn V, were made available in February 1963. The Saturn V vehicle design concept had three Launch Vehicle propulsive stages, and an Instrument Unit (IU) which provided the necessary guidance and control capability of the launch vehicle during the entire ascent and earth orbital phase. As a part of the Saturn V decision, it was determined that elements of the existing Saturn I vehicle and the planned Saturn V would be combined to provide a new mid-range Saturn I vehicle to be designated the Saturn IB. This upgraded Saturn I would provide additional propulsive power to make possible the testing of the Apollo spacecraft in earth orbit much earlier than would have been possible with the Saturn V. The Saturn V was the first large vehicle in the U.S. space program that was both conceived and developed for a specific mission.

The third significant unknown was the flight mission mode in which the flight vehicle would fly as it accessed the moon. The three options provided were a "direct flight" approach which would have required a larger booster than was in our inventory, an Earth Orbit Rendezvous (EOR) approach which would have required additional vehicle launches or an alternate approach which utilized a Lunar Orbit Rendezvous (LOR) technique. Initially, the LOR approach was considered a more risky option primarily because of the unknowns, as we had not yet performed an earth orbital rendezvous. A few of the administration officials argued, however, that the LOR approach provided the simplest approach to landing on the lunar surface, utilized the most cost efficient launch vehicle and, perhaps, most important, had the best chance of making a lunar landing within the decade.

On July 19, 1962, the Lunar Orbit Rendezvous mission mode was selected. The selection of the LOR mode dictated to a great extent the inherent design of the Apollo spacecraft. The spacecraft design concept proposed four main sections: a Command Module (CM), in which the flight crew would be launched and in which the crew would spend most of the duration of the mission; a Service Module (SM) which would provide power, communications and propulsive capabilities; and a Lunar Module (LM) housed in a protective Lunar Module Adapter (LMA) during launch vehicle propulsion activities. The LM would descend to and return from the lunar surface to the CM/SM combination called the CSM while carrying flight crew members. A Launch Escape System (LES) would automatically lift/propel the flight crew, while in the CM, away from the launch vehicle in the event of impending launch vehicle danger.

With the launch site decision made, a subject that had been discussed long and hard was whether or not we would operate with "fixed" launch facilities as in the past at Cape Canaveral, or with mobile launch facilities which appeared to have advantages from a cost, schedule and operational perspective. The key aspects of the mobile launch concept that had cost, schedule and operational advantages were that it allowed for vertical assembly and basic checkout of the space vehicle on a Mobile Launch Platform (MLP) located within an industrial setting and within an environmentally controlled Vertical Assembly Building (VAB). This concept (which will be discussed in detail later) provided for vertical transfer of the assembled space vehicle and mobile launcher, carried by a crawler-transporter across a crawler way (road) to the pad for final checkout, fueling and launch.

This approach mandated the use of extensive automation and provided for test, checkout and launch operations to be performed and controlled from a remote Launch Control Center (LCC). The decision made in July 1962 (after much debate) to proceed with a mobile launch concept led us to plan for the use of two separate areas on Merritt Island for two distinctly different functions. For "launch operations" the Launch Complex 39 (LC-39) complex area was identified for use, and for "technical and administrative support" an Industrial area slightly remote from the LC-39 area was identified.

To support Langley STG Mercury operations at Cape Canaveral, a checkout and launch team comprised of both Langley and McDonnell personnel was established. After two exhaustive years of flight testing at Langley, Wallops Island and at the Cape, the final certification flight of the Mercury-Redstone launch vehicle was initiated on January 31, 1961. It carried Ham, a chimp, on a successful suborbital flight. In early April, the Russians burst our "bubble" to some extent with a successful orbital flight by Yuri Gagarin. Between May 1961 and May 1963 there were six successful manned Mercury spacecraft missions, the first two being launched on Mercury-Redstone (MR) boosters and the latter four on Mercury-Atlas (MA) boosters, all from launch pads on Cape Canaveral. Each of these launch vehicles utilized Rocketdyne designed and supplied engines. The early manned program launches with which most persons are familiar are those of the first Mercury (MR-3), a U.S. sub-orbital flight on May 5, 1961 with Alan B. Shepherd aboard *Freedom 7* and the Mercury (MA-6) flight of John H. Glenn aboard *Friendship 7* on February 20, 1962 as he became the first American to orbit the earth. The final manned Project Mercury mission (MA-7) was launched on May 15, 1963. Astronaut Gordon Cooper, in *Faith 7* successfully completed 22 orbits in space. With his flight, the Mercury Program came to a conclusion. In 1961, while the Mercury program was underway, plans were being made to incorporate an intermediate step between Projects Mercury and Apollo. This project was initially called Mercury Mark II and later renamed Gemini. The Mercury team, in



NASA Photo

Grouped together in front of Mercury spacecraft* "Friendship 7" *are Thomas O'Malley, chief test conductor for General Dynamics; astronaut John H. Glenn, Jr.; and Paul Donnelly, capsule test conductor.

launching and recovering the space capsule and crew of six manned missions had met their three prime project objectives: to orbit a manned spacecraft, to prove that man could survive the experience of weightlessness and g-forces and to recover the spacecraft and astronauts safely after orbiting the earth. Each successful Mercury flight had helped to unify and strengthen our national commitment to the task of sending a man to the moon. With the conclusion of the Mercury Program came the birth of the Gemini Program.

A plan to extend the existing manned spacecraft program with the development of a two-man spacecraft, officially designated Gemini, was identified on January 3, 1962. The Gemini program was managed by MSC under the direction of the Office of Manned Space Flight (OMSF). The NASA plan was to fill the time gap between the last Mercury flight and the first Apollo flight with in-flight activities that would allow us to perfect techniques essential to the successful completion of a manned lunar mission. The prime objectives of the Gemini Program were: subject two crew members and supporting equipment to long duration flights; perform rendezvous and docking with other orbiting vehicles and to maneuver the docked combination by using the target vehicle's propulsion system; perfect methods of reentry and landing of the spacecraft at a pre-selected landing point; accomplish EVA (extra vehicular activity) or spacewalks outside the protection of the spacecraft; and to gain additional information concerning the effects of weightlessness on crew members. The majority of these objectives were considered constraints to a lunar landing.

The design concept of the Gemini program was to enlarge the Mercury capsule's basic structure to accommodate two crew members, to provide it with an orbital maneuvering capability, and to use existing launch boosters and an existing upper rocket stage as a docking target. The "as designed" capsule weighed about twice as much as the Mercury capsule and provided only about 50% more cabin space. The enclosed capsule was extremely cramped. Ejection seats replaced the Mercury's escape rocket and more storage space and fuel cells were added for the longer Gemini missions. The launch vehicle chosen was a Titan II and the rendezvous and docking target chosen was an Agena upper stage. McDonnell built the capsules in St. Louis and processed them at the Cape through Hangar S with some utilization of Hangar AF.

With regard to the Saturn I launch program, the construction and activation of LC-34 was completed in mid-1961 in readiness for Saturn I flights. At the same time, the design of LC-37 was nearing completion. The first Block 1 Saturn I, SA-1 stage arrived by barge on August 24, 1961. The vehicle was successfully launched from LC-34 on October 27, 1961. By mid-1963, four launches and development test flights of the SA-2, the SA-3, and the SA-4 vehicles had been successfully accomplished from LC-34.

In September 1961, NASA made the decision that the permanent home of the Manned Spacecraft Center (MSC) would be in Clearlake, Texas, outside of Houston. MSC would also be the home of Mission Control for all manned space flights and for astronaut training. While new facilities were under construction the Space Task Group at Langley assumed their identified Apollo spacecraft related responsibilities. They negotiated and signed contracts with NAA for the design, development, manufacturing and on-site support of the Apollo Spacecraft (CM, SM, and LES) and Apollo Spacecraft/Lunar Module Adapter (SLA), and a similar contract with the Grumman Corporation for the Lunar Module (LM) Ascent and Descent stages. They also supported NAA in their quest to place General Dynamics/Convair under contract to design and manufacture the "Little Joe 2" launch vehicle to be used in the Apollo abort system test program at the White Sands Missile Range (WSMR). As a part of their new role, they selected additional astronauts and initiated planning for their training both at Cape Canaveral and at MSC.

In October 1962, the transfer of approximately 750 people from Langley, the original home of the STG, to temporary facilities in the immediate Houston area was completed. With that transfer, the program direction for the Mercury, Gemini, and Apollo Projects was centered in Houston. Construction of the MSC facilities continued on schedule. In September 1963, the Manned Spacecraft Center formally opened and MSC assumed responsibility for the Mission Control Center (MCC) as the focal point for all U.S. manned space flights beginning with the Gemini program. As MSC grew, so did the size of the workforce. It nearly tripled over the next several years while the astronaut corps was significantly expanded. Much like the Cape and Marshall Space Flight Center (MSFC), MSC sought to get their arms around a new world full of technological and management challenges.

In Huntsville, Alabama, at the MSFC, NASA negotiated and signed contracts with the Boeing Corporation for design, development and on site support of the first stage of the S-IC, which eventually became the Saturn V. They contracted with North American Aviation for the S-II second stage and with the Douglas Corporation for the S-IVB third stage. Contracts were already in existence with IBM for the IU, for the Saturn I launch vehicle and they continued that contract for the Saturn V launch vehicle. They also signed contracts with NAA's Rocketdyne Division for the Saturn V F-1 first stage engines and for the J-2 second and third stage engines. On September 7, 1961, the Michoud Ordnance Plant (to be redefined as the Michoud Assembly Facility) was identified as the site at which the Saturn IB and Saturn V first stages would be built.

In October 1961, NASA made a decision to establish a national rocket test site in Hancock County, Mississippi. The site was initially named the Mississippi Test Operations (MTO) facility and was subsequently re-designated the Mississippi Test Facility (MTF). It was selected as the site at which all Saturn V first and second stage flight acceptance testing (static firings) would be performed. In 1962, land acquisitions were completed by the U.S. Army Corps of Engineers. Construction of the facility in Hancock County began in 1963 but only after resolving some of the same issues that were faced at the Cape. Dredging of the Pearl River and the digging of miles of canals internal to the site were enormous undertakings. Bridges and roads had to be built and/or modified to accommodate the large vehicle loads. Once construction of the Static Firing facility was started, a salt marsh mosquito plague and an abundance of rainy weather slowed the project. In spite of these obstacles, the construction and activation of the facility was completed in early 1966.

Transportation of the Saturn V flight hardware between the lead contractors' production facilities and Huntsville, MTF and Cape Canaveral was normally accomplished by either barges supplied by NASA or by the Aero Spacelines Pregnant Guppy or Super Guppy.

The responsibilities and composition of the NASA Apollo/Saturn program team at Cape Canaveral expanded rapidly in the early 1960s. On March 7, 1962 NASA announced that LC-39 would be established as an independent NASA installation. As a result, the Launch Operations Directorate (LOD) was redesignated as the Launch Operations Center (LOC). Dr. Kurt Debus was named LOC Director after having served previously as LOD Director and Director of the Army Ballistic Missile Agency Missile Firing Laboratory on the Cape. The LOC was delegated the responsibility for launch facilities planning, design and construction. The separation of management and launch responsibilities at Cape Canaveral between DOD and NASA were further clarified in January 1963. Agreement was reached that the Air Force would be responsible to host and to manage activities at Cape Canaveral and that the NASA (LOC) would do the same at the Merritt Island facilities. Regardless of location, they would each be responsible for their own logistics, administrative and launch operations functions. This agreement ended the bickering over the Merritt Island launch area that had been going on for a long time. In the same time frame, design and operational responsibilities between the Manned Spacecraft Center, Marshall Space Flight Center and the Launch Operations Center were further clarified. NASA LOC was assigned the additional responsibilities for the overall planning and supervision of the integration, test, checkout and launch of all Office of Manned Space Flight (OMSF) vehicles at the Merritt Island site and at the Atlantic Missile Range. An exception to this was the Mercury Program (completion was rapidly approaching) and some elements of the Gemini Program. In mid-1963 the Heavy Space Vehicle Systems Office was established with Rocco Petrone as the Director. His responsibilities for the C-5 (to become the Saturn V) included facilities, operations and site master planning. These changes put Dr. Debus, his Deputy Director Albert Siepert and Rocco Petrone in the drivers seat at the LOC. New employees were arriving from across the country daily. The LOC manpower rose almost 400% between July of 1962 and July of 1963. Office space was at a premium. As a consequence, NASA was forced to separate many of the team members. They located the majority of those working on existing Saturn program hardware in Cape Canaveral based office facilities. A large percentage of the new hires and internal NASA transfers from the Huntsville Launch Vehicles Operations Division were housed in off-site office space in the surrounding communities (i.e., Cape Canaveral, Cocoa Beach, Titusville, etc). This problem of inadequate facilities combined with known inefficiencies, wasn't totally resolved until construction of the Headquarters and Operations and Checkout facilities were completed in 1964/1965.

On September 1, 1963, Dr. George E. Mueller assumed the role of Deputy Associate Administrator of the NASA Manned Space Flight program and Director of the Apollo Program Office at NASA Headquarters. In that capacity, he was responsible to oversee the Apollo Program to its completion and to initiate the development of the Space Shuttle Program. Shortly after assuming his new position and with the understanding that the program was running significantly behind its goal of landing on the moon in the 1960s, he made a bold move. He recommended to the NASA Administrator, James E. Webb, that he cancel four manned earth orbital flights scheduled to utilize the Saturn I Launch Vehicle. He further recommended that the development of the Saturn IB be accelerated for manned flights and that a program of "all up flight vehicle testing" be initiated. Beginning with SA-201, he recommended that all Saturn IB flights should carry operational spacecraft including equipment for extensive testing of the spacecraft systems in orbit. The NASA Administrator concurred with this approach in late October 1963.

In November 1963, President Kennedy toured the Cape Facilities on a visit to keep abreast of the progress on the Apollo program, making his third visit in 21 months. Later in the month we were all shocked, as was the entire world, upon the news of his death. Seven days after his assassination, President Lyndon Johnson renamed the Launch Operations Center and the Cape Canaveral Air Force Station (in a locally controversial move) to be the John F. Kennedy Space Center (KSC).

As we completed the "crucial decision" years, the question in the minds of many was whether or not we were performing to a schedule that would allow us to win the race to the moon. Outwardly, the Russians were still setting the pace – they were the leaders, we were the followers. The Soviet Union's Yuri Gagarin went into earth orbit in April 1961, making him the first human to orbit the earth. The Soviets continued their firsts in space from 1961 through 1965 with successful longer flights. We, unfortunately, suffered through a long drought after Gordon Cooper's Mercury flight in 1963. Less than a year after Gagarin's flight, German Titov remained in orbit for a full day. In 1963 the Russians launched the first woman into space, Valentina Tereshkova, aboard the Vostok 6 spacecraft. In 1964, three Russian cosmonauts orbited the earth for a day in the Voskhod 1 (Sunrise) spacecraft five months before the first U.S. two-man Gemini mission had been scheduled to be launched. In March 1965, Aleksei Leonov performed the first spacewalk from Voskhod 2.

In spite of the Russian progress, the country remained supportive of a program that was perceived to be getting larger,



NASA Photo

Dr. George Mueller gives an orientation of the Saturn V to President John F. Kennedy and officals in Blockhouse 37 on November 16, 1963. Front row, left to right: George Low, Dr. Kurt Debus, Dr. Robert Seamans, James Webb, President Kennedy, Dr. Hugh Dryden, Dr. Wernher von Braun, General Leighten Davis, and Senator George Smathers. This was President Kennedy's last visit to the Cape Canaveral facility prior to his assasination.

more complex and unfortunately more expensive. With the more significant programmatic decisions behind us, and with the world wide political situation threatening us, we went into the attack mode. The effort ahead demanded both technical and management ingenuity and commitment on the part of NASA and of its prime and sub-contractor personnel, and patience and perseverance on the part of the employees and their families. Even more important, it required a high level of both encouragement and financial support from the American people and from Congress.

NAA Space Division at Cape Canaveral

I arrived at Cape Canaveral in late October 1962. The Canaveral Administrative Complex (CAC) was located on A1A just north of The Church of Our Savior Catholic Church and opposite the notorious "Mousetrap" restaurant. In the early Apollo days, CAC was the home of the NAA administrative personnel. Jack Hazard and Wally Ford were the initial Apollo Base Managers located on the Atlantic Missile Range and were supported by a small group of people that represented various NAA administrative disciplines (i.e., personnel, contracts, finance, logistics, etc). At the time, desk space on the Cape was at a premium, and if you didn't have a direct involvement with the hardware, chances were good that you would be located off site (Cocoa, Cocoa Beach, Merritt Island, or Titusville, etc.). As the Apollo program progressed and as NAA and NASA flight hardware and support contractor personnel numbers increased, the problem became even more severe. The lack of adequate space lasted until 1964/1965 when construction of some of the new Apollo facilities were completed on Merritt Island. In the fourth quarter of 1962, shortly before my arrival, NAA had opened a small Project office in the Engineering and Operations (E&O) building within the Cape Canaveral Industrial Area. Our office in the E&O building, originally built for the Mercury Program, was small but at that time the space was adequate to house all of our employees. Don Butler, a long time NAA employee opened the office and was supported by our secretary, Nancy Keenan, and several aircraft experienced field representatives from the NAA quality assurance, logistics, training and facilities organizations. When I came on-board, I was the first NAA engineering representative on site. At that time, I was joined by Dan Jensen, who was our initial ground operations spacecraft processing representative. Our company tie back home to California was into the Apollo Test and Operations organization. The E&O building was located immediately adjacent to Hangar S (originally built for the Vanguard program), and across the street from the Engineering and Laboratory building, the office area of Dr. Debus and his deputies. Hangar AF, located to the south of Hangar S had just been built to support test and checkout of the Apollo boilerplates, the Gemini spacecraft and the smaller Saturn I stages. Hangar S provided the build up and checkout area for the Mercury spacecraft and was the home of the majority of NASA and McDonnell personnel working on the Mercury program. Some of their personnel overflowed into the E&O building. As time progressed and as our NAA organization grew, engineering and operations personnel were located in either the E&O building, in and around Hangar AF or at LC-34 and LC-37 (in trailers) where the initial Apollo boilerplates were to be processed and launched, or in "Splinter City". Splinter City (located a few hundred yards from Hangar AF) was a grouping of portable buildings installed to provide office space for the contractor technical work forces until the Merritt Island facility was completed.

Building the Team and the Community

In the early 1960s—while NASA, prime contractor and sub-contractor personnel across the country embarked on their Apollo system designs, manufacturing and test activities— there were large changes taking place on the Space Coast. Thousands of new employees were streaming into Brevard County to participate in the massive job of developing the launch site and sending men to the moon. The number of employees working on the Apollo Program at Cape Canaveral/KSC grew from a few hundred to over thirty thousand at its peak in 1968. Designers, construction workers, tradesmen and laborers followed by engineers and technicians, all desiring to be a part of the program, "checked in" through the '60s. With this influx of people (primarily young adults and children) came the task of team building on the work sites and of community and infrastructure building in the home environment. New or modified roads and bridges appeared as did housing developments, schools, hospitals and churches. To support the influx came new businesses, stores and restaurants. Initially, Cocoa Beach was the center of the social scene. Bernard's Surf, Ramon's, Lee Caron's Carnival Club, and Wolfies will long be remembered. During the '60s the growth of Merritt Island, Satellite Beach, Cocoa Beach, and Titusville as well as the Orlando area was astounding. McCoy Airport was nearly non-existent. We worked hard and we played hard. For the adults, work related Management Club meetings at the "Glass Bank" in Cocoa Beach, the fire house on Merritt Island and the Rockledge Country Club. Bowling leagues in Satellite Beach and on Merritt Island provided welcome relief from the hectic work activities. For the families, the beaches and boating were favorite activities as were the periodic company picnics and special occasion get-togethers. For the kids, community activities (Scouting, Indian guides, Little League, etc.) expanded rapidly. For most families, both the work and the home environments brought about significant change.

NASA/Contractor Team Must Now Produce

The stage has been set, the goals have been established, the long range planning has been accomplished, the contracts have been negotiated and responsibilities have been clearly defined. It was time to get on with site activation, vehicle development tests and manned spacecraft operations.

To be continued as Part 3 in the Summer 2010 Issue

About the author: After his discharge from the U.S. Marine Corps in 1954 Bill entered Northeastern University as a co-op program student majoring in electrical engineering. His co-op job took him to the MIT Instrumentation Laboratory. Receiving his degree in 1959, he remained on the staff at MIT until he came to NAA in 1962. During his 34 years with NAA/Rockwell, he has served on the Apollo, Space Shuttle and Space Station programs in a supervisory or management position. Half of that time was dedicated to launch operations on Apollo and Space Shuttle at KSC. Since his retirement in 1996, he has served as an aerospace consultant. Bill currently resides in Newbury Park, California with his wondrous wife of 53 years, Penny.

The Production Development Laboratory Story

by James E. Hurzeler

Early Times

In 1941, the Engineering Research Laboratory was the only laboratory existing at the time. As production intensified, the Manufacturing and Inspection Departments complained to upper management that the laboratory was not giving enough support to their functions. By the latter part of 1941, a new laboratory facility was set up in the Engineering Building. The heads of the individual Engineering Research Laboratory functions were transferred there with a number of supporting personnel. The new Production Development Laboratory was formed with selected personnel and equipment left in place. It was still a part of Engineering. A number of these engineers were sent to Kansas City and Dallas to support those wartime plants. In Kansas City the lab reported to Materials and Processes Engineering under Harry Harris.

The Kansas City plant closed in 1945 immediately after VE Day. Harry Harris and Dan Hays transferred from the lab to Inglewood. After that, the lab was transferred to the Quality Assurance Division and became the Production Development Laboratory. The close ties with the Engineering Lab were retained and cooperation with the other branches of Quality Assurance and Manufacturing was enhanced. A new PDL was established just inside the East Gate. The lab was equipped with environmental test chambers (some built there before they were available commercially), chemical and metallurgical analysis equipment, tension/compression testing machines, a mass spectrometer, a gas chromatograph, a complete hydraulics test stand, electrical and electronic test equipment, a full machine shop and, later on, a Metrology laboratory.

The PDL Mission

The PDL Mission was to provide technical support to the production departments such as Manufacturing and Inspection in their job of delivering high quality aircraft products.

This technical support was also available to all other supporting areas of NAA. It included implementation of new materials and processes, as called for by Engineering, development of more efficient equipment, and suggested solutions for daily floor problems which were holding up production. The range of technical support was not only in-house, but also out-house, including suppliers of materials and equipment, offsite processing (heat treating, casting, plating), subcontractors and other divisions of NAA.

The PDL approach to problem solving was based on a "make it happen" attitude. This was evident when I brought in a sticky political problem from one of the shops for Dan Hay's guidance. His sage advice was, "Call yourself Daniel and head for the den." The PDL was there to solve problems, not to look for divine guidance. Harry Harris gave definite assignments and then let the assignee work it out. He did not micromanage the problem.

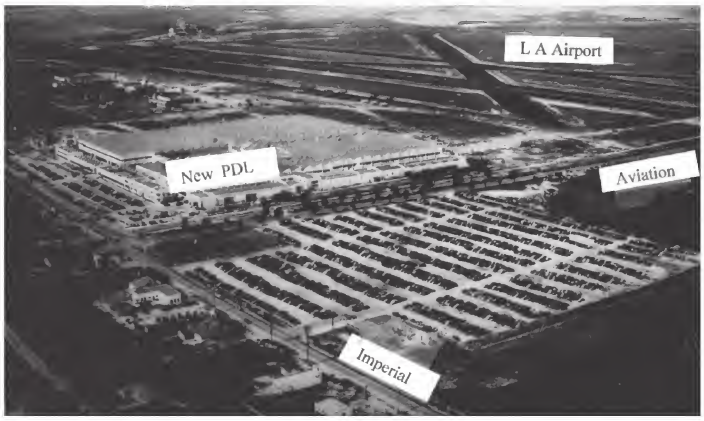
Hard Times

Harry fought to keep the PDL alive, but by 1946 the operation was reduced to 16 people. The main area of activity was the Navion, which was a four place civilian airplane. One of the tasks the lab was given was to set up a real Navion airplane in the East Dock, which at that time was being used as a lab annex. The Navion was experiencing some now-forgotten problem in the hydraulic system. The airplane was set up on jacks with a motor to drive the hydraulic pump and air cylinders or solenoids rigged to operate the controls. A sequence panel was built with relays and timers "liberated" by friends in Spotwelder Maintenance and the airplane was repeatedly "flown". Start pump, flaps down, gear up, flaps up, flaps down, gear down, flaps up, stop pump. Dutch Kindelberger came by one day and observed that the nose gear was slamming down due to lack of relative wind and a bungee was added to the system to brake the fall.

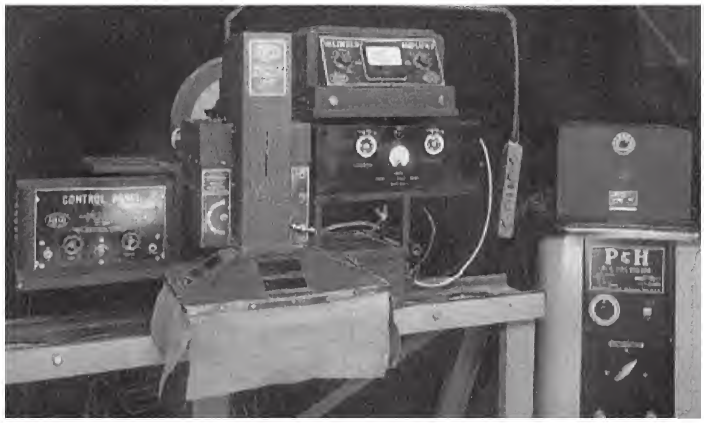
During those lean days, the Company and Power Plant Engineering were gearing up for the new turbo jet engines. A wooden test stand was erected on the grass between taxiways just west of Aviation Boulevard. The PDL made sound level, exhaust temperature and velocity measurements, which were reported to Facilities. They then designed the large transit panels that are still along the fence at Runway 25 R and L.

Post War Production

With the jet engines came the first jet fighter contract for the Navy FJ-1 Fury. That was followed by the F-86 Sabre. The F-86 included various under-wing rockets, bombs and fuel tanks. All of these drop assemblies required welded stabilizing struts, by the thousands. PDL designed, built, and installed in the Welding Department, the first NAA automated welder.



PDL Location 1944-1946



First Automated Strut Welder, 1948

Components from many different companies were integrated to relieve the Weldor (man) from all of the tedious, slow control of a half dozen variables and still produce the same 32 inch quality weld every time. Further, the automated control eliminated the "crater cracks" at the tail of the weld.

Process Control

In house, many processes were modernized with mechanized, electronic controls to remove the "man from the loop" wherever possible. One example was spot and seam welding where the control knobs were replaced with positive stop rotary switches. This meant that each release of parts was welded with the same "certified" machine settings because the machine settings were not dependent on the operator and could be verified by inspection.

Another was the need for all test instrumentation, research, manufacturing, inspection and flight line standards to read the same and be interchangeable. Dan Hays and Ed Caustin established a Standards Lab, which calibrated all measuring equipment involved in building and inspecting the product. The Standards Lab's measurement equipment had its calibrations traceable to the National Bureau of Standards. This program spread throughout the industry and lead to the ability of all involved to verify results, including the Customer. This eliminated a lot of misunderstanding and produced a better product. Today, this concept is referred to as Metrology and includes periodic recall, repair and re-certify all certifications. But it was started by the PDL to assure consistency of all measurements.

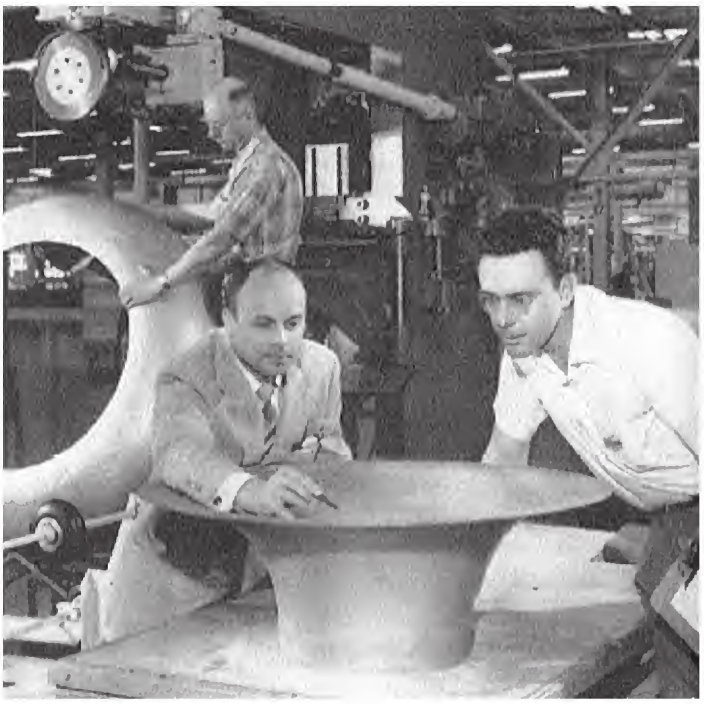
Product Control

The increasing performance level of the aircraft that Engineering designed established new challenges for the equipment on board and for their suppliers. To reduce early failure problems, the PDL developed a testing program to verify that production units would perform as required. A sample unit selected at random would be put through the various specification tests to verify performance/compliance (the Quality Verification Test or QVT). This early evaluation of production units not only removed early failures from the production line, but also eliminated early failures in the field. NAA Field Service representatives sent their Unsatisfactory Reports (or URs) to the PDL from their assigned Air Force bases for immediate attention.

The PDL goal was to resolve those equipment failures as far back in the production line as possible. Quite often, this meant conducting the failure analysis and then visiting the supplier, with Purchasing, to get corrective action. In the PDL, the action included Mechanical, Pneumatic, Hydraulic, Chemical, Metallurgical and Electrical Sectional personnel working as a team. The Construction Section built test equipment as needed. This effort alone, provided the ultimate Customer-the pilot in the cockpit-the assurance that onboard equipment would perform as required.

Assembly Support

The post war aircraft industry began to show a great deal of interest in rockets-particularly German rockets. When the Aerophysics and Atomic Energy Laboratories were set up in a secret area on the second floor of the tooling building at LAD, the PDL was there. Martin Boe was making experimental rocket tankage for a redesigned V-2 missile. This work was done on manufacturing equipment and was done on nights and



Production Seam Welder, 1957-1959

weekends due to the high level of security. The PDL was there because of the familiarity with the equipment and processes and a Top Secret clearance. When the group was moved to the old Consolidated Vultee plant in Downey, the PDL helped Ed Childs, Jim Cunningham and Ross Clark move and setup the Manufacturing line.

One assignment for the PDL, by Ross, was to check out a company car, pick up Don Dawson from the Engineering Lab, Jim and Ross and take a one-day tour of the welding departments of major aircraft companies in the San Diego area. They visited Ryan, Rohr, Solar and Consolidated. Had lunch in Tijuana and returned to LAD. Because each company had unique equipment and capabilities, this trip gave the Manufacturing decision makers a broad view of what welding capabilities were available. It also helped the PDL in writing the equipment specifications for welding equipment procurement.

Martin Boe and others finished their "redesign" and about a half dozen rockets were built. After test stand firing and Evaluation, the Customer released this basic design throughout the aircraft industry for scale up. This evolved into the Redstone Missile, which was the early workhorse for the Space Age.

By this time, the Navaho program was well underway and Harry Harris realized that part time support of two or three men was insufficient. He moved Harry Moshenrose and many other PDL engineers to the Downey facility and built the Missile Division PDL.

The Navaho and an empty plant offered an opportunity to set up a new Manufacturing facility designed for assembly welding. The X-10 and G-26 airframe design allowed machine welding in both longitudinal and circumferential directions. Some twenty-five different assembly welds were tested and certified by the PDL on the original X-10 design. However, Manuel Sanz invented "chem milling" and the PDL set up ultrasonic thickness measurement of chem milled skins. The skins were immediately redesigned to window frame construction, which after chem milling, provided thicker, uniform flanges for the

weld. The welds were four or five times the strength of the original thin skin designs. More importantly, they reduced the certified setups from twenty-five to only two, one each for the longitudinal and circumferential welds.

As we were leaving the Downey plant one Thursday afternoon in July of 1957, we saw signs telling us "Do not come to work Friday. The Plant is closed." And it was! There was other work in process, but the Navaho program was cancelled. We transferred as many as we could to LAD to support the X-15 program.

The X-15 was another assembly weld design. The thermal conditions during Mach 6 flight required the use of high-nickel alloys. The welding parameters were completely opposite from aluminum welding. The rate of heat flow was very slow. Therefore, the weld had to be slowed down to allow the nickel to melt. The PDL developed machine settings in the lab and then worked with Manufacturing to set up their new automated and tooled equipment on the floor.

Next, were the inspection problems for these welded joints. At that time, all X-ray inspections were performed by the PDL. Our old equipment was replaced, upgraded and automated to meet Manufacturing schedules. Even so, working three crews, seven days a week, for two and one half years we barely kept up! Some 6,000 X-ray shots were made and marked up for the required rework. The Welding Group alone had forty engineers and technicians.

In addition to in-house development, there was always outhouse activity. One such was the manufacturing and test of pressure vessels for various X-15 functions. The subcontractor was Menasco Manufacturing in Burbank. Their process, Uniwelding, was a gas pressure welding process. These vessels were located throughout the X-15 and vital to flight operations. The PDL assigned a knowledgeable engineer to follow this assignment.

Although this article may appear to glorify welding, that is not the intent. Welding stands on it's own achievements. Welding made possible aircraft flight at Mach 6, spacecraft missions to the Moon, space weapons and ballistic missiles to keep the Cold War cold. There are many other facets in the manufacturing of airborne hardware. But welding provided the structure and tankage that contained all the other equipment and people. The PDL was there to do that early development work before the specific organizations existed.



PDL X-Ray Setup

Phase Out

The PDL had a satellite group at Palmdale for the B-70 program, which included Radiographic Inspection out in the assembly area. This approach came to full fruition on subsequent programs. However, in the meantime, Manufacturing and Tooling had adapted the equipment to fabricate the B-70 so less support was needed from the PDL.

Harry Harris moved several times and finally became Director of Quality and Reliability before he retired. Next, Ed Caustin moved up to replace Harry. Then Bill Kriens replaced Ed. Bill had just concluded a management assignment at the Sabreliner plant in Mexicali.

After Harry Moshenrose transferred to Downey, others moved as well. Nat Green was off to the Columbus Division for the Navy contracts and Tom Kluge went to Mitsubishi, Japan for the F-86F Mutual Air Program; Soji Tori, a Mitsubishi employee, brought a number of their people who trained in the PDL. Two hot pilots, Bill Yoakley and Jack Nunnaly, spent a year in the PDL during the X-15 program.

Ken Asay and Bert Davis went to Atomics International after Bert had developed the welding procedures used to assemble the Sodium Reactor Experiment. Bill McMahon, an old timer, developed a very successful fiber optics business and left NAA. Bob Hilliard also left for a career in cable TV. John Bosco, who did the early X-ray inspection on those first rocket engines, went to Rocketdyne as Manager of nondestructive testing (NDT). Ron Bishop, who came to the PDL on the X-15 and followed NDT through the B-70 and Saturn/Apollo programs, was Director of Quality Assurance on the Space Shuttle.

Jim Hurzeler went to Manufacturing as a Project Coordinator for the LAD produced Ground Support Equipment (GSE) and S-II tank hardware for the Saturn/Apollo program. Later, he was responsible for coordination of the Diffusion Bonding Scale up Project for production of the B-1 titanium carry through section.

Ralph Eaglen came to the PDL during the X-15 and left for Quality Assurance on the B-70. He subsequently advanced through many programs and positions at LAD, Rocketdyne and Space Division. He has been a Vice President for both Quality Assurance and Manufacturing.

Summary

The developments discussed in this article were only a portion of the overall activities being conducted but they illustrate why NAA was such a fantastic company. The Materials and Process developments that were inherently part of these activities played a significant role in the capture and management of major aerospace programs in both military aircraft and space exploration. The establishment of the PDL concept is just one example of the many areas of forward thinking by NAA Management.

About the Author: Jim joined NAA after service in Europe during World War II. During his 32 years of service with NAA, Jim served on several fighter and bomber programs, as well as the X-15 and Saturn S-II projects. In his career, Jim progressed from Research Engineer to Manager of Quality Assurance/Research and Development. He retired in 1978. Jim resides in Palos Verdes Estates, California with his charming wife of 66 years, Coleen.

"Father of the Orbiter"

Ed Smith was in Florida to witness the launch of STS-130—one of the last shuttle missions—with his wife, Susie and daughter, Krista. He was recognized (much to his embarrassment) as the "Father of the Orbiter" at the luncheon meeting of the National Space Club in front of 250 of today's space scientists at the Kennedy Space Center.



Lee Solid, John Tribe, Ed Smith, and Bill Heink

Congratulations and Best Wishes to

Joseph and Virginia Beerer
of Santa Barbara, California
celebrating their 71st Wedding Anniversary

Leroy and Marie Stuart
of Lake Elsinore, California
celebrating their 70th Wedding Anniversary

James and Arline Hollen
of Thousand Palms, California
celebrating their 67th Wedding Anniversary

William and Edna Sward
of Orange, California
celebrating their 65th Wedding Anniversary

Daniel and Alfreda Walsh
of Anaheim, California
celebrating their 63rd Wedding Anniversary

Robert and Bessie Wilmoth
of Overland Park, Kansas
celebrating their 62nd Wedding Anniversary

Robert and Orba Lee Krueger
of Lakewood, California
celebrating their 60th Wedding Anniversary

Ray "Pete" and Jean Peterson
of Los Angeles, California
celebrating their 60th Wedding Anniversary

Pio and Frances Nieto
of Fullerton, California
celebrating their 56th Wedding Anniversary

Arthur and Shirley Corriveau
of Lady Lake, Florida
celebrating their 53rd Wedding Anniversary

Ken and Patricia Granville
of Bellflower, California
celebrating their 50th Wedding Anniversary

Dale "Duke" and Ursula Smith
of Redondo Beach, California
celebrating their 50th Wedding Anniversary

Contrails From The Past

by Ed Rusinek

Dear Ed,

I couldn't bring myself to cut out the subscription form out of the Bulletin to renew my subscription. I worked on both the P-51B and D as a teenager during World War II. My sister worked on the B-25 Mitchell bomber in the same building near where LAX is located now. I love the Mustang so the Winter Issue was especially enjoyable to me!

—Lila Lev, Lakewood, CA

Ed's Ans.: It is always a pleasure to receive a note from folks that worked on NAA airplanes because their enthusiasm over what they helped build never leaves them. Please do not cut up your issue of the Bulletin to resubscribe. Just send us your check and Sonnie and Stan will do the rest!

Dear Ed,

In Pittsburgh in 1955, we took our first newborn to the doctor for her 3-month checkup. It snowed while we waited in the doctor's office. To get home, I had to put the chains on the car. We got home cold and wet and all caught colds.

North American Aviation was interviewing in downtown Pittsburgh for jobs in sunny California. They offered me a job and moved us. Signed in at Downey, worked at Slauson and was told to go to Canoga Park if I wanted to buy a house because that's where I would be working.

Spent the next 28 years in Engine System design—Navaho G-38, Jupiter, Redstone (V-2), Thor, E-1 Breadboard, and finally SST. Loved all of it!

Oh! Bought a house in Tarzana-moved in on December 28, 1955—still here. Thank you North American Aviation!

—Howard Seese, Reseda, CA

Eds Ans.: In the 1950s, there were a lot of aviation companies in Southern California. If one lost a contract, you simply interviewed with another. However, none had the fire or the drive that defined NAA. Whatever you did, you pushed the "envelope" in Structures, Propulsion, Electronics, Materials and Manufacturing! Thank you Howard, for your thumbnail sketch-reminded many of us as to how we got here too!

Dear Ed,

You print some wonderful articles about the pilots, engineers and technicians but we never hear from the support staff of "girls" responsible for the letters, reports, vacation notices, technical reports, and messages. My 24 years of service were the most exciting time of my working experience. I hired in at Autonetics in June 1961 and the adventures began! We moved from Compton to Anaheim in 1962, three small buildings in the middle of a lemon grove on Katella Avenue.

I will never forget where I was in 1963—in Bldg. 69 in Anaheim—when the lady in the next cubicle whispered to me that the President had been assassinated.

My last 14 years were spent in Seal Beach on the GPS. When the Shuttle made its first landing, televisions were brought in and we sat on the stairways to watch. Shouts of joy went up, people hugged each other and some had happy tears on their cheeks!

I met some of my best friends at NAA and we still communicate with each other after 50 years. So it wasn't just the engineers and technicians in these marvelous events. We "girls", had a quiet but essential role too. Bless them all!

—Kathryne Pessin, Beaverton, OR

Ed's Ans.: The Aviation Industry always had a hard time accepting women as equals. In the early 1950s I was in the Stress Group in Downey. The engineers' time was considered too important to fill in endless tables of numbers related to their failure analyses, so interspersed among us were women with mathematics degrees whose assignment was to pound out the columns of numbers on their Friden calculators. I always admired Bobbie Johnson. She was the first lady to move up into Engineering Management!

Dear Ed,

In my article *Mustangs Over Japan* you have a typo which I am sure your sharp eyed readers will find. It reads: "…Major Harry Crum completed 50 missions in 21 hours…". That should read 210 hours.

—John Lambert, Saint Paul, MN

Eds Ans.: We proofread your story a half dozen times but we got hooked on the story and forgot to catch it! John, we hope that you will honor us with another story soon!

Dear Ed,

In the Fall Issue, you asked for comments regarding a potential subscription increase. I am a Silver Eagle, but I am willing to pay whatever is necessary to continue to receive this excellent publication. Just let me know, and I will send a check for any reasonable increase. I love to read about the "Good Old Days". Keep up the outstanding effort!

—William Sanderman, Colorado Springs, CO

Eds Ans.: As we prepare each issue for publication, we often wonder are you readers as keen to read these stories as we are to print them. We think the increase to $15.00 should keep us solvent but we are grateful to you and the many other retirees for the kind words and generous offers.

Dear Ed,

Have enjoyed the Bulletin for many years. I just wanted to make a comment about the kindness of Lee Atwood. I was secretary to the Vice President of Research and Engineering, Bernard Haber. Mr. Atwood stopped me in the hallway one day and said, *"Mary, now that Bernie is retiring due to his illness, do you have a job?"* I told him that I did but I appreciated his thoughtfulness.

—Mary Leone, Fort Mill, SC

Ed's Ans.: Mr. Atwood was a very straightforward and honest man. His handshake was as good as a signed contract. Unfortunately, he didn't realize that in shaking Al Rockwell's hand, you better count your fingers afterward.

The Silent Majority

by Stan Guzy

ANDERSON, PAUL R., 86 – of Scottsdale, AZ. Retirees Bulletin notice returned stamped "Deceased". Paul died on December 17, 2009. He retired from LAD in 1980 with 30 years of service. Paul is survived by his loving wife of 56 years, Maribeth.

ARDANAZ, ARNOLD "BUD", 71 – passed away on November 28, 2009 from undisclosed causes. Bud grew up in Inglewood, CA, attended Mt. Carmel HS in Los Angeles, went to USC on a football scholarship, and graduated in 1961. He worked at NAA/RI for 34 years. He leaves behind his wife of 54 years, JoAnn.

BOWMAN, FRED A., 81 – a resident of Trinity, TX, Fred passed away on September 15, 2009. Fred retired as an engineer from Space Division-Houston in 1988 with 33 years of service. He is survived by his loving wife of 57 years, Colleen.

BOWSER, LAWRENCE G., SR., 86 – passed away on November 23, 2009 from undisclosed causes. He was preceded in death by his wife, Ferne Francis. He had traveled the world on top-secret projects and the B-1 Bomber, Space Shuttle, Space Station and many others during his service with NAA/RI.

CLARK, ROBERT J., 90 – of Oxnard, CA passed away suddenly on November 28, 2009. A Cal Tech graduate, he was a noted aircraft designer on the XAJ bomber. He later was the NAA representative in Europe and was named a delegate to NATO where he was assigned to the NATO Industrial Advisory Group. He completed 27 years of service and retired from the NAA Corporate Office in 1970. He is survived by his wife "Midge".

COKELEY, EDMOND R., 90 – died in Yorba Linda, CA following a stroke on November 25, 2009. He had served in WWII as an advanced flight instructor at various airfields in Texas before being sent to MIT in Boston for graduate school in aeronautical engineering. Upon completing his MBA program, he was reassigned to the Air Force Research and Development Center at Wright-Patterson Field in Dayton, OH. As WWII came to an end, Ed began a long career with NAA/RI where he directed flight test activities on the X-15 at Edwards AFB; managed the Minuteman Safety Program on the Minuteman GPS at Autonetics; and in the final phases of his career, served as System Safety Project Engineer on the Space Shuttle Program at the Space Division in Downey, CA. During his service at NAA/RI he earned two additional MBAs and completed the coursework for his PhD in Engineering from Arizona State University. Ed retired from NAA/RI in 1990 at the age of 71 with 40 years of service. Ed will always be remembered for his repertoire of funny stories. He was preceded in death by his first wife, Patricia; his second wife, Doris; and survived by his third wife, Georgia.

CROWLEY, WILLIAM I. "BILL", 86 – passed away on April 13, 2009 of a heart attack in Monroe, WA. Bill served with the U.S. Marine Corps in the Pacific during World War II. He joined NAA with Missile Systems in Neosho, moving later to Space and Aircraft at Tulsa in Production Control and Program Management. He was the Program Manager on the Boeing 747 projects. Bill also served on the "Lighter Than Air" technical committee of the AIAA. He retired from Tulsa in 1989 with 41years of service.

CUPPS, JOSEPH L., SR., 87 – died December 2, 2009 from undisclosed causes. He retired from the Autonetics Division of NAA/RI in 1981 after 28 years of service. Joe is survived by his wife, Lola Mae.

DANIELSON, OPAL R., 95 – died peacefully on January 29, 2010. Opal had been employed at NAA/RI and McDonnell Douglas as a Supply Coordinator for over 30 years prior to her retirement. She was preceded in death by three husbands.

DE LANDA, ADRIAN, 86 – Adrian died on December 15, 2009 from undisclosed causes. He retired from NAA/RI after 28 years of service and immediately began a 25-year career in Real Estate. He is survived by his beloved wife, Emilia.

DOMINGUEZ, RUBEN "SMILING RUBE", 84 – of Yorba Linda, CA died on December 4, 2009. He retired from RI as a navigational instrument engineer after 36 years of service. His wife of 38 years, Josephine, survives him.

EARLY, HELEN, 92 – passed away at home in Wheaton, IL on October 2, 2009. She joined NAA at LAD in 1950 and retired from Downey in 1977. Although she only had a high school education, she advanced to a design engineer on the Apollo and Space Shuttle after working on the X-15, B-1, and the XB-70 programs.

FONT, HENRY "HANK", 96 – succumbed to emphysema in Long Beach, CA on January 24, 2010. A graduate of Whittier College (BA) and Stanford University (MBA), Hank joined Autonetics in 1950 and served as an administrative assistant until 1979. He resided in the Belmont Shore area of Long Beach for over 60 years and was never married.

FOWLER, JACK L., – passed away on November 15, 2009 in Sharpsburg, GA. He served at NAA/RI for 27 years. He is survived by his second wife of 27 years, Vera Mae.

HILTON, HERBERT C. "CHUCK", 91 – of Wickenburg, AZ passed away on December 7, 2009. Chuck joined NAA at LAD in 1951 and retired from Rockwell Anaheim in 1984 with 33 years of service. He is survived by his loving wife of 53 years, Diane.

JOHNSON, DARRELL L. "MIKE", 83 – of Westminster, CA died suddenly on October 1, 2009 following an accident from the day before. Mike joined Rocketdyne in 1955 and continued at Corporate in El Segundo and Pittsburgh before he retired in 1978. Mike was predeceased by his wife of 47 years, Joyce, who also served at NAA from 1945 to 1972.

KAYLOR, JANET, 75 – of Buckeye Lake, OH, passed away in Jensen Beach, FL after a long series of illnesses. Jan started as a secretary in Quality Control at the Columbus Division in 1956. She transferred to Engineering as a secretary in the Design Group in 1959 and left in 1963 to become a full-time stay at home mother. She is survived by her husband of 47 years, Norbert. He retired from Engineering in 1989 with 34 years of service.

KRAUSE, JAMES A., 84 – of Buena Park, CA passed away on November 9, 2009. James had been an Executive Chauffeur for NAA/RI for 27 years. He is survived by his wife, Robbie-Joe.

LEABERRY, GORDON A., 71 – passed away in Las Vegas, NV on November 16, 2009 after a sudden illness. Gordon immigrated from England at the age of 17 and eventually became a

tool design engineer. He joined NAA and was project manager on several projects including the B-1 wing carry-through. He retired from Tulsa/LAD Tooling in 1993 with 22 years of service. He is survived by his loving wife Jeanne.

LISTON, JEAN, – of Los Alamitos, CA retired from the Seal Beach facility in 1991 with 31 years of service. Retirees Bulletin returned stamped "Deceased". No further information was available.

MARTZ, KENNETH W., 84 – passed away on January 24, 2010 from undisclosed causes. He had served our country in the Navy and helped put men on the moon as an Apollo engineer at the Space Division in Downey, CA. He is survived by his wife, Edwina.

McCOY, BEATRICE M., 78 – died on September 15, 2008 in Boise, ID. Beatrice retired from Satellite Systems in 1990 after 27 years of service as an administrative assistant on the Apollo program in Downey and the NAVSTAR GPS in Seal Beach.

MORRIS, GEORGE L. "BUD", 77 – passed away at home in Lewiston, CA on April 18, 2009. George retired from Autonetics in 1987 with 22 years of service on the assembly line and 5 years in management. He is survived by his loving wife of 44 years, Gwen. She also retired from Autonetics with 27 years service.

OLSON, JOHN M., SR., 90 – passed away on December 25, 2009. A long time resident of Orange County, he worked in electronics at the Autonetics Division for many years. His specialty was in timing devices for the U.S. missile programs and he was adept at troubleshooting and repairing the devices. He was preceded in death by his wife, Bernice.

PISEY, GEORGE F., 86 – of Westminster, CA died on July 16, 2009. George worked on the Shuttle/External Tank disconnects in Downey and the Shuttle tiles at Edwards AFB. He retired in 1989 with 26 years of service. He is survived by his wife of 56 years, Gay.

ROTHSCHILD, BILL F., 85 – passed away at The Village in Sherman Oaks, CA on December 28, 2009. He was trained and formally educated in the field of chemistry, receiving an MS degree from the University of Chicago. His work as an electrochemist in the aerospace industry at the Autonetics Division and General Motors resulted in the award of two patents. In 1978, he was named as one of NAA/RI's Engineers of the Year. He is survived by his wife of 60 years, Trudy.

SCHRADER, ROBERT L. "BOB", 82 – of Manhattan Beach, CA, died on November 24, 2009 as a result of a vehicle accident in Morongo Valley, CA. After serving with the Navy in the Pacific during World War II, Bob attended a photography school and was hired by NAA in 1952 to work in the dark room photo department. He was promoted to Industrial Photographer and flew in the rear seat of chase fighter planes to photograph the XB-70 and the X-15. He retired in 1992 with over 42 years of service.

STEELE, ELBERT S., 84 – passed away in Salt Lake City, UT on January 6, 2010. Elbert was a B-17 pilot with the 8th Air Force, flying over 20 missions. Near the end of the war, his crew dropped food to the starving people of the Netherlands. He joined NAA as an engineer on the F-100, X-15, XB-70, and the B-1. He retired in 1985 as an engineering supervisor with 37 years of service. For many years, Elbert and his beloved wife, Beth, were very active in their church, including a mission to the Philippines.

THOMSON, WALLACE B., 92 – passed away peacefully in Prescott, AZ on December 28, 2009. Wally served as a U.S. Marine Corps fighter pilot in the South Pacific during WWII. During his service in aerospace he acquired six patents and retired from Boeing as an Engineer of the Year. He is survived by his wife Myrtle.

VARNEAU, G. "GORDY", 89 – passed away peacefully on January 12, 2010 in Las Vegas, NV. He served in the U.S. Army Air Force during WWII as a pilot and eventually became a flight instructor. In 1948 he joined NAA as a field engineer, traveling to Air Force bases worldwide providing instruction to pilots. He was preceded in death by his wife, V. Faye.

LOST SHEEP, BULLETIN RETURNED WITH NO FORWARDING ADDRESS

JAMES G. CLUNE – AUBURN, CA

DIANE GRISWOLD – WARNER ROBINS, GA

LUCY KANDROTAS – HAWTHORNE, CA

GEORGE A. PATTERSON, JR. – FALLBROOK, CA

KENNETH L. PIERCE – MENIFEE, CA

NORMA WOLF – ROLLING HILLS ESTATES, CA

CLARIFICATION PLEASE: It was pointed out to the Editor that Mr. Bastian "Buzz" Hello was Vice President and General Manager of North American Aviation Operations at KSC through 1969. Near the end of December 1969, he transferred to California to take charge of the Space Shuttle Proposal effort. At the same time, Mr. Tom O'Malley was promoted to fill the position vacated by Mr. Hello. Hence, both gentlemen were in charge of operations at KSC in 1969, even if only for a few days.

NORTH AMERICAN AVIATION
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P.O. Box 3797
Seal Beach, CA 90740

North American Aviation Retirees Bulletin
"WHERE THE BEST NEVER REST"

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Photo courtesy of Nissen Davis

Bob Hoover Receives 2009 Howard Hughes Memorial Award – *Robert A. "Bob" Hoover, World War II fighter pilot, USAF experimental test pilot, North American Aviation test pilot, and very famous demonstration pilot was chosen by the Aero Club of Southern California to be the 31st recipient of the Howard Hughes Memorial Award. The annual award, presented to Bob by Neil Armstrong and Chuck Yeager at a banquet in Los Angeles on February 10, 2010, recognizes aerospace leaders that have made significant contributions to the advancement of aviation and space technology.*

NORTH AMERICAN AVIATION
Retirees Bulletin

"Where The Best Never Rest"

Summer 2010

Inside:

NORTH AMERICAN AVIATION AT U.S. AIR FORCE ACADEMY GRADUATIONS

THE HARD WAY HOME

NAA AT CAPE CANAVERAL AND KSC – PART III by Bill Edson

ON THE EARLY RETIREMENT OF THE SPACE SHUTTLE by George Jeffs

48TH BALD EAGLES REUNION LUNCHEON by Lee French



Photo provided by the USAFA

The Astronautics Department at the U.S. Air Force Academy opted to use the North American Aviation Recognition Award funding to recognize the top academic performers in each of the Astronautics Engineering classes for 2009-2010. The following cadets were selected: Front Row (L. to R.) C1C Thomas Chasson, C1C Stephen Renner, C1C Thomas "Woody" Sukut, C1C Clark Beesemyer, C2C Leanna Hoffman, C1C Wayne Black IV, C1C Michael Albert. Back Row (L. to R.) C1C Robert Steigerwald, C1C Ryan Gauntt, C1C Frank Martinez, C3C Dustin Hayhurst, C2C Thomas Ainscough, C2C Eric Prince, Col. Martin France (Department Head), C3C Caleb Whitlock, C1C William Percoski, Brig. Gen. Robert Giffen, USAF (Ret.), LTC John Swanson, U.S. Army Reserve, Dr. Jerry Sellers, Advisor. Col. Swanson, an old friend of the NAA Retirees Bulletin, represented North American Aviation.

NORTH AMERICAN AVIATION
Retirees Bulletin

North American Aviation Retirees Bulletin, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAAR Bulletin can be contacted at The Boeing Company, Seal Beach facility by phone at (562) 797-3836. Send mail to:

North American Aviation Retirees Bulletin
P. O. Box 3797
Seal Beach, CA 90740

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Dear NAA Retirees Bulletin Subscriber

With this issue, we must hasten with an apology to most of our readers. With the renewal period, we received about forty renewals containing checks for $10.00 rather than the new fee of $15.00. To identify those subscribers, we stated in our last issue that if "your address still has December 2010*, your resubscription payment still lacks the $5.00". Unfortunately, many readers did not see the ASTERISK and sent us an extra $5.00 or a note indicating that they had paid the $15.00 as requested. It took us weeks to straighten out the mess and we apologize for the added consternation. At our age, we certainly do not need that!

We are pleased to announce that this is our tenth year of publication since Boeing cut us loose without warning after sponsoring only one issue. Our very determined editor, Michel Juif, scraped together enough donations to print and mail out 9,400 copies of a "freebie" issue with a plea for subscribers. More than 3,300 of you responded with checks and words of encouragement. Over the years since those skimpy days, we have lost more than a 1,000 of you to the Silent Majority. We lost our office space at Boeing in Seal Beach. We lost our P.O. Box in the Boeing mailroom. We lost our editor. We lost many of our retiree authors who so generously offered their time and energy to provide the splendid articles you have enjoyed over the years in this Bulletin. If this was not enough, we had to accommodate five postal rate increases in the mailing out of the Bulletin. In spite of all this, we have managed to not only keep the Bulletin "alive" but to expand from 12 pages to 16 pages, and finally, to 20 pages. If there is anything we have learned from our many years serving at North American Aviation, it is that there is no problem that can't be solved and no issue that can't be resolved!

As mentioned last year, the Bulletin has completed a financial sponsorship with the U.S. Air Force Academy to have a North American Aviation Award presented yearly to the two most outstanding graduating cadets in the Aeronautical Department and the most outstanding graduating cadet in the Astronautical Department, and a similar award to be made to the outstanding cadet candidate graduating from the Academy Prep School. This May, it was the first time that these recognition awards have been made. Although we did not attend, two good friends, John Swanson and Norman Jarvis, were honored to represent NAA and they performed an admirable service. Thank you both!

In a last moment, we learned of the brief but profound essay by George Jeffs regarding the scrapping of the Space Shuttle. We quickly obtained permission from the author and the publisher to reprint the article in this issue. His analysis is superb!

If you missed this year's Bald Eagles Reunion Luncheon and were able to make it, shame on you! It was a splendid affair and a lot of old familiar faces showed up. Do try to make it next year. Some of the folks needed walkers but they were there front and center! The speaker, Major Scott Higgenbotham, gave a speech that roused everyone's heart!

AUTONETICS DEDICATION

On Tuesday, August 3, 2010, a dedication of an Autonetics Commemorative Monument honoring the people and legacy of Autonetics will be held from 9 to 11 a.m. at the former Autonetics site in Anaheim.

The site, located at 3195 East La Palma Avenue in Anaheim, has been designated as a Boeing Heritage Site. The event is FREE, but it requested that every person planning to attend RSVP so we will be able to plan accordingly.

For any questions in the meantime, call Ed Venanzi, Planning Team Representative, at (714) 779-5652 or (714) 345-8790.

NORTH AMERICAN AVIATION OUTSTANDING CADET RECOGNITION AWARDS

The North American Aviation Recognition Awards are sponsored by the North American Aviation Retirees Bulletin to be presented each year to the two outstanding graduating cadets in Aeronautical Engineering, the cadet graduating in Astronautics Engineering, and the candidate cadet from the Prep School. In recognizing these outperforming and motivated individuals, we wish to perpetuate the very best in the future with the name of *North American Aviation*, the company where creative minds in design, ingenuity in manufacturing and dedication in field service provided the best trainers in the T-6 Texan, the best bombers in the B-25 Mitchell, the best fighters in the P-51 Mustang, the best jet fighters in the F-86 Sabre, the best jet bombers in the B-1 Lancer, the best lunar spacecraft in the Apollo-Saturn, and the best space transporter in the Space Shuttle. Our other accomplishments included the best Guidance Systems for space vehicles and nuclear submarines, the best Rocket Engines for a multitude of U.S. rocket ships, the first GPS System orbiting the Earth. Our company no longer exists and this is our Last Hurrah. Therefore, we think it is only fitting that the name North American Aviation be associated with young people who have volunteered to serve and defend our Nation in the skies and the heavens! God Bless!

Edmund Rusinek, Editor
North American Aviation Retirees Bulletin

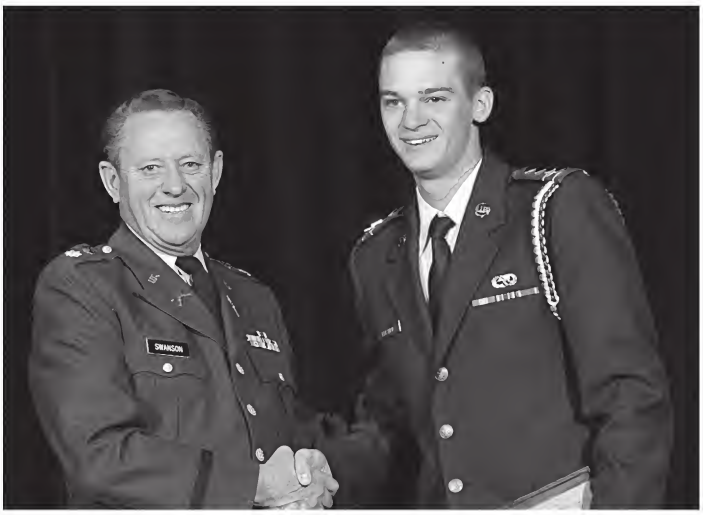


Photo courtesy of Mr. Mark E. Winter

The Outstanding Cadet Candidate at the U.S. Air Force Academy Prep School was Christopher S. Keranen (right), here receiving the NAA Recognition Award by LTC John Swanson, U.S. Army Reserve.



Photo courtesy of Maj. Kara Greene, USAF

Lt. Col. Norman Jarvis, USAF (Ret.) presents the Outstanding Cadet Award in Aerodynamics to Cadet Jonathan M. Benson. Col. Jarvis, a long-time friend of the NAA Retirees Bulletin, represented North American Aviation.



Photo courtesy of Maj. Kara Greene, USAF

Dr. Tom Yechout (left) announces the two winners of the Excellence in Applied Research, Cadet Darren R. Montes and Cadet Trenton J. West.

NAA at Cape Canaveral and KSC – Part III

by Bill Edson

NAA Space Division at Cape Canaveral

In January 1963, Dr. Kurt Debus and Dr. Wernher von Braun conducted a formal NASA ground-breaking ceremony for the Merritt Island Manned Spacecraft Operations Building (MSOB) eventually to be called the Operations and Checkout facility. In February 1963, the first joint NASA/NAA Apollo Launch Operations status review meeting was conducted by G. Merritt Preston, who at that time was managing our Apollo Command/Service Module (CSM) operational contract. Jim Pearce, Director of Apollo Test Operations at each of the NAA Apollo test facilities; John Moore, the Manager of NAA Canaveral Test Operations; J. N. King, the NAA S-II Program Liaison Coordinator; Cecil Knowles, representing QC; and Gil Utecht, the administrative manager at the Atlantic Missile Range were in attendance. Leading the NAA contingent from Downey was John Paup, our VP and Program Manager; Charlie Feltz, Assistant Program Manager and Chief Engineer; and Ray Pyle, representing Project Engineering. Subsequent to this review, members of the NAA work force at Cape Canaveral were introduced to our Downey Apollo Program management team and to our new bosses: Jim Pearce, John Moore and Ray Pyle. By mid-1963 our new management team members had taken up residence in Florida. Throughout 1963, our small group of NAA engineering and operations personnel initiated a spacecraft and ground operations planning and scheduling effort in support of the program. In addition to our primary operational planning responsibilities, we attempted to become more familiar with the overall Apollo program, with our NASA Customer counterparts most of whom were involved with the Mercury Project and with the NASA ways of doing business as they were being developed on Mercury and Saturn I. Over the first year of our existence at Cape Canaveral, our spacecraft workforce built up fairly quickly, totaling about 150 people by the end of 1963.

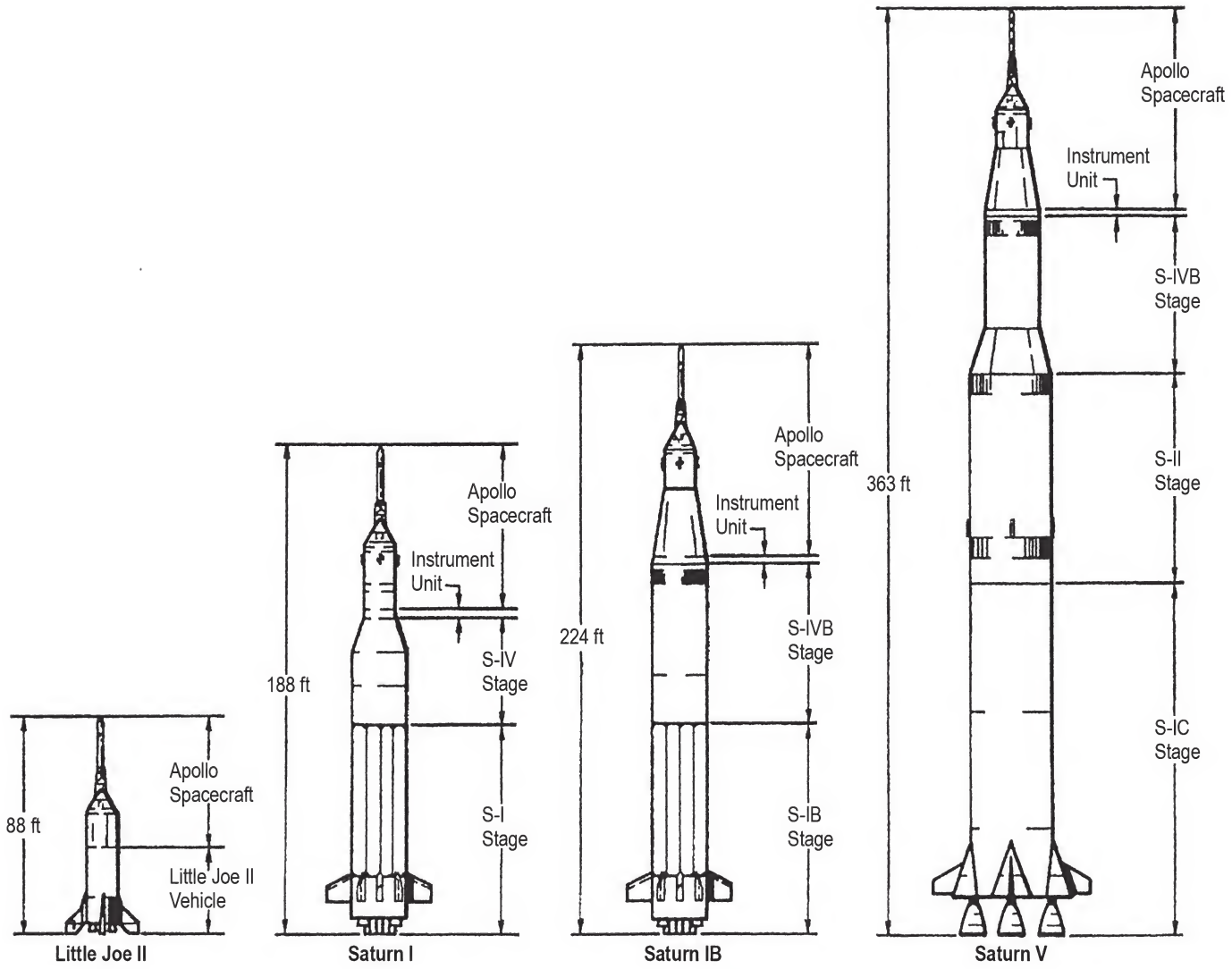
Saturn V Flight Vehicle Configuration and Mission

The design concept of the Saturn V stack identified three major sections: a launch vehicle configuration, the Apollo spacecraft referred to as the Command/Service Module (CSM) and a Lunar Module (LM), sometimes referred to as the Lunar Excursion Module (LEM).

The Saturn V launch vehicle consisted of three propulsion stages and an Instrument Unit (IU), which included the booster guidance and control system. The mission of a Saturn V configuration started with the ignition of the S-IC first stage's five F-1 engines, which combined developed 7.5 million pounds of thrust. After ignition, they burned for 2.5 minutes while accelerating the spacecraft to a speed of approximately 6,000 miles per hour. After engine shutdown, the first stage was separated from the rest of the vehicle and the second stage engines were ignited. The S-II second stage's five J-2 engines burned for approximately 6 minutes, taking the spacecraft to a speed of 15,300 miles per hour and an altitude of about 115 miles. After engine shutdown, the second stage was separated from the vehicle and the S-IVB third stage's J-2 engine was ignited. After ignition, the S-IVB accelerated the spacecraft velocity to 17,500 miles per hour putting the spacecraft into earth orbit. A second burn of the S-IVB's J-2 engine was designed to provide a translunar injection capability and to release the vehicle from the pull of gravity while providing an "impetus" to the spacecraft up to 24,300 miles per hour while on its translunar trajectory. While on that trajectory and after the CSM and LM had docked, the S-IVB stage and the IU would be separated from the spacecraft and released into space. The CSM/LM combination then continued to follow the translunar trajectory, bound for the lunar surface. The Boeing Company provided the S-IC stage, NAA the S-II stage, Douglas the S-IVB stage, and IBM the IU. The Rocketdyne Division of NAA supplied each of the primary stage engines.

The NAA Apollo spacecraft design included four major sections: a Command Module (CM), a Launch Escape System (LES), a Service Module (SM), and a Spacecraft Lunar Module Adapter (SLA). The CM was the control center of the Apollo spacecraft and sheltered the three astronauts from launch through their ocean splashdown. It had a pressurized main crew cabin, crew couches, control and instrument panels, a forward docking hatch with a docking tunnel, a side hatch, five windows and an environmental control system. The CM design also included an air-ground communication (voice and data) capability, a guidance and navigation system and a reaction control system (RCS) comprised of small hypergolic-fed thruster engines which provided attitude and rotational control of the vehicle. It also included a parachute landing and recovery system, and a heat shield to protect the CM during the high heat re-entry. The LES provided the capability to separate and propel the CM away from the Saturn V should an emergency (abort) condition occur on the pad, or from a launch vehicle with an in-flight problem. It was designed to automatically fire a solid-fuel escape rocket which directed the CM away from the launch vehicle. Once free of the unsafe launch vehicle environment, the CM Earth Landing System would be activated and would provide the capability for the CM to slowly descend on parachutes and to safely splashdown on water. If no abort situation occurred, the LES would be jettisoned shortly after liftoff. The SM, a non-pressurized element of the spacecraft provided a fuel cell power system (utilizing oxygen and hydrogen), an RCS which also used hypergolic-fed thruster engines, and an S-band antenna for communication with Mission Control. Large sections within the SM contained hypergolic fuel and oxidizer propellant tanks for the Main Propulsion System (MPS). The MPS engine provided a mid-course correction capability between the earth and the moon, and a translunar orbital insertion and transearth entry capability. The SM remained attached to the CM until just prior to re-entry at which time it was jettisoned. The SLA provided a protective shell/enclosure for the LM from launch through SLA panel deployment which occurred while the entire spacecraft was lunar bound.

The Lunar Module, provided by Grumman Aircraft, was designed specifically to provide the capability of separating



Apollo Launch Vehicle Configurations

from a lunar orbiting CSM and of landing on the lunar surface. Upon completion of lunar activities, it provided the capability to ascend from the lunar surface and to dock with the CSM. It had a limited protective heat shield and was of such lightweight construction that it would not have been able to fly under earth gravity conditions. The LM was the only element of the Apollo spacecraft that was a true "spaceship". It was designed to have two major modules, a Descent Module and an Ascent Module. The Descent Module housed landing gear, a landing radar antenna, a descent rocket engine and adequate fuel to land on the lunar surface. It also contained adequate storage area to accommodate equipment to be utilized on the surface of the moon. The Ascent Module, the control center of the LM provided an ascent propulsion capability from the lunar surface and a rendezvous and docking capability with the CSM. It contained a crew cabin, instrument panels, an overhead hatch/docking port and a forward hatch, navigation and RCS, rendezvous radar, and environmental control and communications systems. It also contained an ascent rocket engine with sufficient propellant to return to lunar orbit and rendezvous with the CSM.

Once under contract, the Apollo spacecraft and Saturn V launch vehicle stage design engineers completed the requirement definition phase and began to solidify their design concepts and to bring their subcontractors on board. In California, the size of the NAA Apollo spacecraft and second stage workforces doubled between mid-1962 and mid-1963. Hundreds of design and manufacturing subcontractors were placed on contract. At the home plants of each of the other stage and spacecraft contractors a similar manpower build-up occurred. For the next several years each contractor placed emphasis on their program goals, flight and ground system designs, the production of test and flight hardware; and the identification and conduct of various component, sub-system, engine, and stage development, qualification, certification and acceptance test programs.

The Mobile Launch Concept

The idea of assembling a rocket remote from the launch pad and then moving it to a launch area dated back to World War II and Peenemunde when the German V-2 rocket team transported rockets horizontally into checkout stalls, and upon the completion of checkout, rolled them out in a vertical attitude to the launch pad. On the Cape, Redstone and Jupiter programs employed the mobile launch concept with

the rockets traveling from the assembly building to the pad in a horizontal attitude. Between mid-1961 and mid-1962 much controversy was focused on the flight vehicle transportation mode to be used between the Vertical Assembly Building (VAB) and the pad (ground transporter, rail system or barge) and on our ability to design for the expected vibration, bending and wind loads during handling and transportation operations. The operational scenario agreed upon in mid-1962 followed this sequence: a Mobile Launcher (ML) was carried into a VAB high bay by a Crawler-Transporter (CT) and parked on support pedestals within the bay. The S-IC first stage of a Saturn V rocket was off-loaded from a barge at the barge turning basin and moved horizontally, into a VAB low bay on a transporter. After movement into the VAB transfer aisle, the stage was tilted to the vertical, raised inside the cell to allow for the necessary clearances and then lowered to the Mobile Launch Platform (MLP). The second and third stages were brought into the low bay and placed in checkout cells. Inspection, checkout and interface tests of all three stages proceeded concurrently. The S-II second stage, followed by the S-IVB third stage and the IU were removed from the low bay cells and sequentially mated. Each stage was electronically connected to the ML RCA-110 computer system which was connected to the Launch Control Center (LCC) RCA-110 computer network. At that point, integrated launch vehicle stack testing was initiated. Meanwhile, similar spacecraft module testing was underway in the Industrial Area. Upon completion of the spacecraft testing, the spacecraft was carried vertically on a low bed transporter to the VAB transfer aisle where it was lifted and mated to the Saturn V. When interface testing of the Saturn V stage/spacecraft was performed and completed, the VAB high bay doors were opened and the CT picked up the ML and the Saturn V rocket for transfer to the Launch Complex 39 (LC-39) launch pad. The ML proceeded along the crawlerway to the launch pad surface where the ML was parked on support pedestals. At that point the MLP became the Saturn V launch platform.

Saturn V LOC Facility Development Planning

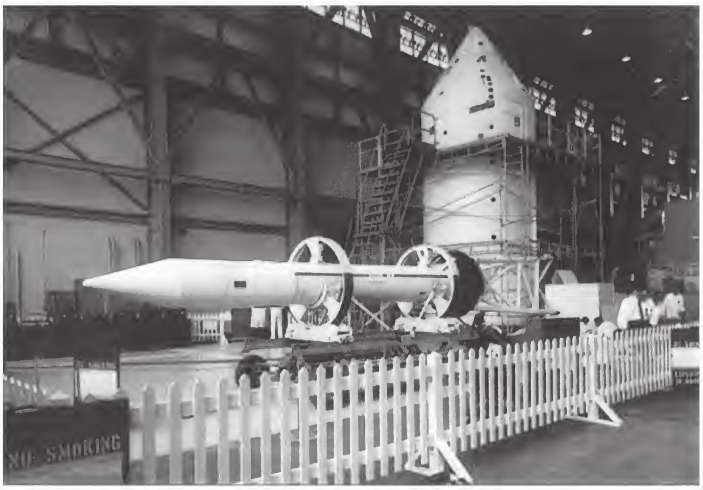
In 1963, with the majority of the socio/political decisions that might impact the development of launch facilities behind them, the NASA Launch Operations Center (LOC, later to be known as the Kennedy Space Center, or KSC) was ready to initiate the design and construction of LC-39 and the Industrial Area. Throughout the timeframe over which the LC-39 mobile launch concept was being vigorously pursued, numerous studies provided concepts and requirements directly applicable to preliminary design of many of the facilities. When combined with preliminary ground system requirements provided by the various vehicle stage prime contractors in early 1963, LOC had a pretty good starting point for facility design and construction contract bid packages. Before any construction work could be completed on Merritt Island, the LOC initiated the preparation of each of the sites (cleared the land of surface growth brush, orange and mango trees and palmettos, etc.) and dredged access channels as necessary to support the project. In late 1962 and early 1963, the U.S. Army Corps of Engineers started to award contracts for site preparation, facility construction and for utility installations. The first land-clearing contractor started his initial work in October 1962 and completed the initial contract in September 1963. The sand and muck dredged up was deposited on the projected sites of the VAB, Pad A, the Crawler Transporter path to the pad and the Banana River Causeway. At Pad A, pyramids of sand 30 feet high were deposited. In July 1963, the land level in the VAB area had been raised 7 feet while at the same time the barge channel to the VAB turning basin was opened for barges that would transport rocket stages to the VAB. Shortly after the completion of the first contract, the support contractor was given a second contract and began pumping and delivering fill to Pad B and to the projected causeway from Cape Canaveral to Merritt Island, east of the Industrial Area. In late 1962 the Corps of Engineers created a new management office, the Canaveral District, to supervise brick and mortar construction contracts for NASA. The Florida East Coast Railroad built a causeway across the Indian River connecting the spaceport to the mainland in order to haul freight directly to the building sites. NASA ground system design management and the Corps of Engineers undertook the enormous task of assembling a government and contractor workforce from all over the country that could pull the launch site design and construction effort together.

In mid-1963, the Corps of Engineers awarded a contract for the construction of primary utilities in the Industrial Area. The contract provided for a water distribution system, sewer lines, an electrical system, a central heating plant, roads and hydraulic fill for the Indian River Causeway to connect the Industrial area on Merritt Island with the Mainland. The Corps of Engineers also awarded the initial construction contracts for some facilities in the Industrial Area. As soon as sufficient conceptual and design information was available, support contractors from around the country were placed under contract to perform facility design and construction of the primary facilities at LC-39 and in the Industrial Area. Throughout this timeframe the ground system designers struggled to keep the configurations of their designs "in sync" with those of the flight vehicle designers. As a "follow-on" to design and construction contracts, "brick and mortar" contracts were released. In many cases these contracts accounted for basic facility systems such as water, electrical power, sewage and roads. Throughout the 1963 and 1964 timeframe, more support contractors and new facilities began to emerge. Although each individual facility had its unique "ups and downs", construction progressed extremely well. On Merritt Island in October 1964, there were 4,300 construction force employees, 1,670 federal employees, 1,900 support service employees, and 860 employees of launch vehicle contractors. On the Cape, there were over 500 federal employees and over 1,000 contractor employees working on Gemini or Apollo. The overall employment at Cape Kennedy and Merritt Island was expected to exceed 15,000 in early 1965. All of the Merritt Island Launch Area contracting, design, construction and outfitting (i.e., bridge cranes, swing arms, hold downs, etc.) was the responsibility of the NASA design groups and/or of their support contractors. Based on the OMSF program schedule, LC-39 had to be available in February 1966 to support Saturn V Facility Verification Vehicle activities. The NASA goal was

to initiate the outfitting of the various facilities 6-9 months prior to the start of activation. In the Industrial Area the start of site activation was planned for January 1965 and on LC-39 a few months later. Each of the prime flight system design contractors were responsible to identify hardware unique test, checkout, servicing, handling and operational requirements that specified a ground system design need. That design need was fulfilled (as agreed upon) by either the flight system contractor or by KSC ground system designers. Site activation was the responsibility of each of the flight hardware contractors. It required that each of the ground system design, operational and interface requirements previously identified be validated prior to connection of the ground system hardware to the flight vehicle. To do so, the contractor installed and interconnected each unique piece of ground system hardware (there were thousands) that implemented those requirements. By test, analysis, or similarity, each requirement had been properly validated. When the ground system performance was verified to be consistent with the identified requirements, it was considered ready to connect to the flight hardware.

Boilerplate, Block 1 & 2 Spacecraft Hardware

NAA made the decision early in the program that it would produce three separate and distinct articles of spacecraft hardware for major test or for flight use: boilerplate (BP) spacecraft hardware, Block 1 spacecraft hardware and Block 2 spacecraft hardware. The first test articles were BP spacecraft articles. These test articles were pre-production spacecraft items similar to their production counterparts in size, shape, mass, and center of gravity, but not necessarily in function. Block 1 spacecraft articles were limited-production type flight weight spacecraft used for flight systems development and qualification. The CSMs used for all manned missions were of the Block 2 design configuration. Although similar to the Block 1 spacecraft, significant design changes may have been made as the result of new requirements, design improvements or technical incompatibilities found during test or operations.



The first Apollo boilerplate to fly during the program was BP-13, shown here in Hangar AF at Cape Kennedy before being taken to the lauch complex to be mated with the Saturn SA-6 launch vehicle. The Apollo escape rocket and tower are in the foreground.

Early Apollo Developmental Flight Test

Over the next several years, while the Saturn V flight hardware and its checkout and launch facilities were being designed and constructed, numerous flight test programs were conducted. They were undertaken utilizing the Saturn family of launch vehicles as building blocks, which were supplemented over time with the addition of an increased spacecraft complexity. Our success in these programs ultimately gave us the confidence to attempt a launch and subsequent landing on the lunar surface.

WSMR Abort Flight Test (1962-1966)

Under contract to design and build the Apollo spacecraft, NAA identified an immediate need to man-rate the vehicle. The program of man-rating the Apollo spacecraft LES and ELS was originally planned to be conducted at the U.S. Air Force Eastern Test Range (ETR). Because of a heavy schedule of high priority launches at that facility, other possible launch sites were evaluated. Launch Complex 36, Area #3 at the White Sands Missile Range (WSMR), previously used for Redstone missile tests was ultimately selected as the most suitable for meeting schedule and of providing the necessary support. The WSMR allowed for land recovery which was less costly and complicated than the water recovery procedures that would have been required at the ETR. In addition, the WSMR provided the facilities, resources and services necessary to support the program. When it was determined that there was no reasonably priced launch vehicle available that could meet the requirements of the planned tests, a contract was awarded for the development and construction of a specialized launch vehicle (Little Joe II). From November 1963 until January 1966, a series of unmanned flight tests were conducted from LC-36 Area #3 to investigate the adverse effects on the Apollo spacecraft of an abort while on the pad or during an early in-flight timeframe. The two-stage Little Joe II vehicle was sized to match the interface diameter of the Apollo SM. Each stage of the Little Joe II utilized Algol solid rocket motors to power the Apollo spacecraft to its test altitude. A similar predecessor launch vehicle was supplied by NAA to support the Mercury abort systems test program. The command and service modules used in the abort program evolved from the simple structure of BP-6 (which represented only the proper aerodynamic shape), to the production spacecraft structure of Airframe 002, a flight weight Block 1 structure. While the launch vehicle stages and the spacecraft elements were being assembled at their respective factories, LC-36 Area #3 was activated by the launch team. The program was conducted under the direction of the Manned Spacecraft Center (MSC). Test participation was provided by NAA, General Dynamics (GD, the prime contractor for the Little Joe II launch vehicle), and from NASA engineering and quality personnel from MSC and from the LOC in Florida. The NAA Manager of the WSMR facility was Jack Proctor. Over the duration of the program, there were seven launches from LC-36 Area #3. The Little Joe II Qualification Test Vehicle was launched successfully on August 28, 1963, opening the door for the start of the Abort System development test program. Two pad abort tests, each utilizing a boilerplate CM and LES were conducted in which the LES was activated at ground level. In addition there were four sub-orbital launches of the Little Joe II vehicles, each

carrying CM/LES abort system hardware. The final abort system test flight was in January 1966. Some problems were discovered during the program, dictating design changes to the vehicle. To ensure the proper CM attitude control for all abort conditions, canards were added to the forward end of the LES. To protect the CM windows from the LES motor exhaust, a Boost Protective Cover was added to envelope the CM during the early boost stage of a mission. All objectives of the abort system development test program were met and the LES and ELS were qualified for manned flight.

Saturn I Unmanned Flight Test (1961-1965)

The early identification of the Saturn launch vehicle family occurred prior to the final decision that man would attempt to land on the lunar surface. The launch vehicles consisted of the Saturn I, Saturn IB, and Saturn V. Each of the vehicles played an important role in the Apollo program. The primary purpose of the ten Saturn I series of unmanned missions was to flight qualify the launch vehicle stages and systems and to determine their structural compatibility with the spacecraft. Missions SA-1 through SA-4 were designated as Block 1 configured missions and SA-5 through SA-10 were identified as Block 2 missions. By the time the NAA Apollo Project office had opened at the Cape in late 1962, NASA had already successfully flown three Chrysler Block 1 vehicles from LC-34 on sub-orbital flights. The Saturn I Block 1 first stage utilized eight (8) H-1 Rocketdyne engines while the second stage, a water-ballasted dummy stage, provided stability to the vehicle. The fourth Block 1 vehicle (SA-4) was successfully flown on a sub-orbital mission in March 1963. All four Saturn I Block 1 flights launched from LC-34 met the flight objectives and provided the program with insight into the capabilities of large clustered boosters and of the potential for use of larger launch vehicles on future space flights. The primary purpose of the six Saturn I Block 2 flights was to prove our capability to place large payloads into orbit. A by-product of the last three of the Block 2 flights was obtained from the Pegasus experiments which were conducted to extend our knowledge of the ionosphere and to gather essential data on meteoroid activity in space. Significant design changes were made to the Saturn I Block 2 launch vehicle configuration. This vehicle was comprised of two stages. The S-I first stage, built by Chrysler with enlarged fuel tanks, stabilizing fins and upgraded H-1 engines. The first stage produced 1.5 million pounds of thrust. A new active S-IV second stage built by Douglas featured six Pratt Whitney RL-10 engines that burned LO_2 and LH_2 and produced 90,000 pounds of thrust. An IU which housed the electronics that controlled the S-I ascent trajectory was located forward of the second stage. The first version of the IU flown on SA-5, -6 and -7 was an experimental version designed and built by MSFC. New and expanded launch facility capabilities at Launch Complex 37B (LC-37B) were required to support both the vehicle design configuration and to provide additional operational flexibility. With these vehicle and ground system changes came a cost increase and an increase in complexity at LC-37B. Additional dredging of the Banana River was initiated in 1961 to provide more land area. A new free standing launch umbilical tower was much taller than the previous one, the blockhouse was expanded from that of LC-34 and a self-propelled rail mounted Mobile Service Structure that provided 360-degree access to the vehicle was added. The S-IVB required a new propellant servicing system and two hydrogen burn ponds. The number of telemetry measurements nearly doubled from that of previous vehicles. To enhance the support capability available to the smaller Saturn stages, and to the Gemini and Apollo spacecraft, Hangar AF was constructed in the Canaveral Industrial Area to provide spacecraft and launch vehicle work area as well as additional office space. The objective of the SA-5 mission was to prove the design and operation of each of the two propulsion stages and the IU, the compatibility of the three elements, the successful separation of the first and second stages and the readiness of LC-37B to support spacecraft operations. With the SI stage arrival by barge and the S-IVB stage and IU element by aircraft, the individual stages of SA-5 were erected/stacked in October 1963. In late January 1964, SA-5 was successfully launched while being viewed on national television. The program objectives of the Saturn I Block 2 vehicle were met in their entirety. With this launch, the S-IV stage had placed the heaviest payload in history into orbit. Many have since described the satisfactory completion of this mission as “the first step to the moon”.

In the 1963-64 timeframe we were an evolving KSC organization with Jack Hazard and Wally Ford leading us. Gil Utecht managed the administrative support function, Jim Pearce had the responsibility to manage KSC Apollo CSM Operations and John Hansel led the Quality and Reliability function. Reporting to Jim was John Moore (Test Operations), Dick Barton (Test Sites), Ray Pyle (Project Engineering) and Don Libby (Shop and Technician Operations). Reporting to John Moore was Bruce Haight, the General Supervisor responsible for spacecraft engineering and ground operations planning and implementation. In running the day-to-day effort, Bruce relied heavily upon former Navajo and Hound Dog compatriots Chuck Hannon his electrical systems supervisor and Chuck Stephens his mechanical systems supervisor. Bruce assigned Bob Gore and Dan Jensen the Test Project Engineering (TPE) operational management responsibility over their respective BP-13 and BP-15 test teams. Don Bower was identified as the lead engineer to activate Hangar AF and Tony Pailleron was assigned that responsibility at LC-37B. Each technical discipline assigned the appropriate personnel to the SA-6 (BP-13) and SA-7 (BP-15) test teams. Instrumental in their support of the teams were Frank Groark, Earl Wilen, Ray McCoy, Sam Moody, Harry Heilman, Vester Sheeley, Gene Bjerning, Guy Campbell, Larry Sussman, and Jim Mewborn.

In early 1963 we began to analyze the LC-37B and the BP-13 and BP-15 design and operational requirements. We supported the design reviews and program milestone reviews in Downey for each piece of hardware scheduled for delivery to KSC. As time progressed, we initiated the development of operational documentation in support of SA-6 and SA-7 launch processing activities. During the BP-13 manufacturing/processing flow in Downey, NAA, and NASA KSC instituted a practice of providing manpower support to ATO for each major test or assembly milestone that occurred during the spacecraft processing flow. A precedent to this approach had previously been established on the Mercury program in St. Louis. Ted Sasseen of NASA and Bob Gore of NAA led

the combined team of KSC engineers, test conductors and operational personnel in support of the BP-13 flight hardware assembly test and checkout operations in Buildings 1, 6, and 290 in Downey. Over time we agreed that this approach was beneficial to both ATO and to KSC. Downey received much needed help while KSC gained experience. The major hardware elements of BP-13 were transported to KSC in February 1964 for an anticipated May launch. The orbital configuration of the spacecraft included a boilerplate CM, SM, SM extension to the LV adapter, and a production type LES. The CM consisted of a crew compartment, main hatch, aft heat shield, forward compartment cover, forward access way, and instrumentation communications and environmental control sub-systems. The SM provided housing for instrumentation system hardware. It connected to the CM through a non-functional separation mechanism. On BP-13 the launch escape and pitch control motors were inert. The boilerplate was instrumented to provide in-flight environmental/thermal data to support post flight structural and thermal evaluations. The design of BP-13 was quite simple, compared to the complexity of the hardware that we eventually processed on Apollo. The primary objective of the mission was to demonstrate the compatibility of the Apollo spacecraft with the Saturn I launch vehicle configuration in a space environment similar to that expected on Apollo/Saturn orbital flights. A secondary objective of the mission was to demonstrate the primary mode of launch escape tower jettison using the escape tower jettison motor. BP-13 ground operations in Hangar AF at KSC continued for 6 weeks. Upon the mating of the spacecraft to the launch vehicle in April 1964, test team members finally believed that we had become a part of the Apollo launch team. An occasional glimpse of Dr. Debus or Dr. von Braun in the blockhouse was quite motivating. Working out of the LC-37B blockhouse was new to many of us. Engineers on the test consoles relied on event display lamps, analog meters and paper recorders. Launch vehicle pad operations followed a standardized building block approach that although slightly modified by spacecraft operational requirements over the years, it was rigidly followed. SA-6 was successfully launched into earth orbit on May 28, 1964. The spacecraft, S-IV stage and Instrument Unit were inserted into orbit as a single unit. The spacecraft was not designed to survive entry and was not recovered. All of the primary and secondary objectives of the mission were met. The physical compatibility of the spacecraft with the launch vehicle under pre-flight and flight conditions was proven as was the primary mode of launch escape tower jettison. The program schedule called for the launch of SA-7 carrying BP-15 from LC-37B in late summer. The SA-7 mission was designed to mirror the flight of SA-6 and to again demonstrate the compatibility of the Saturn I launch vehicle with the spacecraft in a space environment similar to that of the SA-6 mission. The mission carried a virtually identical BP-15 configuration. A minor change was the addition of a SM simulated RCS Quad engine package instrumented to allow for acquisition of inflight thermal and vibration data. The most significant change from a NAA BP perspective was that the launch escape tower was to be jettisoned using the live launch escape and pitch control motors. The most significant launch vehicle modification was the addition of a flight programmable computer in lieu of the pre-programmable box used on previous missions. Operationally speaking, there were three significant changes in this flow: the MILA ordnance storage facility was made available for the first time to support hazardous LES operations; the LES tower configuration carrying live escape rockets was installed late in the pad flow; and a Countdown Demonstration Test (CDDT) was added to the Saturn vehicle launch pad operational flow. In June 1964, the flight hardware was shipped to KSC. Physical mate and alignment of the CM and SM was completed in Hangar AF and the CSM was mated to the launch vehicle in late June. The launch pad hardware flow of the SA-6 mission duplicated that of SA-5 with the exception of the items mentioned. Testing of the stacked vehicle was impacted by hurricanes Cleo and Dora in the August/September timeframe. During the conduct of the first ever CDDT, President Johnson made a surprise visit to the blockhouse. SA-7 was successfully launched into earth orbit on September 18, 1964. As on the SA-6 mission, there were no plans for recovery of BP-15. All launch vehicle and spacecraft test objectives were met, setting the stage for the final three Saturn I launch attempts, and for the first Gemini and Apollo CSM Block 1 spacecraft launches. Each of the last three Saturn flight test vehicles (launched in the sequence SA-9, SA-8, and SA-10) carried a boilerplate CM, SM, LES, and SLA. The orbital configuration of the payload consisted of the Pegasus winged satellite mounted on the adapter and enclosed within the SM. MSFC had total design, production and operational responsibility for the payload configuration, and the NAA role was one of support. The SM remained attached to the IU and the expended S-IV stage. After first stage separation and second stage ignition, the LES was jettisoned (a secondary objective of the launch, as was the continued acquisition of RCS Quad thermal data). When the second stage reached orbit, the Apollo CSMs were jettisoned into separate orbits. The Pegasus wings remained attached to the Saturn 1 second stage. When the second stage reached orbit, a motor driven device extended the wings on the Pegasus to a span of 96 feet. The wings carried 208 panels that reported punctures of micrometeoroids at high altitudes where the manned Apollo missions could be orbiting. Spacecraft designers were interested in that information because the Apollo spacecraft and crew would be placed in jeopardy if tiny particles should puncture a spacecraft skin. Between February and July 1965, all three vehicles were successfully launched. Each of the objectives of the Saturn I launch vehicle, the BP spacecraft and the Pegasus satellites were attained.

Gemini Manned Flight Test (1964-1966)

In early 1961 when the NASA initially discussed the need for a Mercury Mark II program, a significant concern was the gap of 3-4 years between the last Mercury flight and the first scheduled Apollo manned flight. If this was the case, the U.S. would not have been able to develop the hardware and flight crew experience levels necessary to initiate the Apollo manned flight program when it did. The primary areas of concern were rendezvous, docking with other orbiting vehicles, orbital maneuvering, lifting re-entry and landing and operating in a zero-g environment for long durations. Knowledge in each of these areas, eventually identified as program objectives, was essential if we were to be successful in our quest for the moon in the late 1960s.

In December 1961, NASA announced plans to develop a two-man Mercury capsule and McDonnell was selected to design and to develop it. In the same month, the Titan II, built by Martin Marietta was selected as the launch vehicle to carry the spacecraft. The Mercury Mark II program was renamed "Gemini" in early 1962. In April 1963, McDonnell signed a contract to develop the Gemini spacecraft. From late 1962 through 1964, while developing the space capsule, McDonnell encountered serious budgetary problems that impacted the manufacture, test and delivery of the launch vehicle and the spacecraft. Based on technical and budgetary constraints the decision was made to eliminate the Paraglider from the Gemini program and to baseline "water" landings. During the Gemini program there were twelve Gemini capsules launched from LC-19 by Titan II rockets (Gemini Launch Vehicles, GLV-1 through -12). The first two of the vehicles were unmanned while the remaining ten were manned capsules. The Gemini 1 design approach used on the first test vehicle was very similar to that of the boilerplate concept utilized by NAA on the Apollo program. A heavily instrumented spacecraft "shell" carried dummy equipment and ballast to match the size and shape, weight, center of gravity, and moment of inertia characteristics of the actual spacecraft, yet still provided adequate hardware capability to meet the mission objectives. Gemini 1 was delivered by McDonnell to Hangar AF at the Atlantic Missile Range (AMR) Industrial Area in early October 1963. Inspection, assembly and checkout of the spacecraft, went fairly quickly. The Gemini 1 spacecraft aboard GLV-1 was launched successfully on April 8, 1964. The primary objective of the first mission was to verify the structural integrity and compatibility of Gemini 1 and the Titan II rocket system. Both elements of the vehicle functioned well within specification and the mission was deemed a success. In 1963, a combination of increased complexity, design change, and contractor hardware delivery problems slowed the Gemini 2 manufacturing build and checkout process. The spacecraft was shipped to Florida in September 1964 and was successfully launched in January 1965. The primary objective of the mission, to demonstrate the adequacy of the spacecraft entry heat protection system during a maximum heating rate return was met. In 1964, the first manned vehicle, Gemini 3, ran into a multitude of design, manufacturing and checkout concerns. One of the concerns was attributed to lack of a configuration management system that provided adequate program change control. As a consequence, NASA established Configuration Control Boards on both the Gemini and Apollo programs. Shortly after the introduction of these boards, a series of reviews, inspections and certifications were established that became key checkpoints on the program. These same checkpoints (PDR, CDR, FACI, COFW, DCR, and FRR), were also introduced onto the Apollo program. The Gemini 3 capsule was mated to the launch vehicle in late 1964 and was launched successfully in March 1965 with Astronauts Gus Grissom and John Young aboard. This Gemini manned launch occurred almost 22 months after the last Mercury launch. The primary goal of the mission, to operate and test the spacecraft systems and to successfully recover the vehicle and crew was met. Subsequent to the launch of Gemini 3 the program successfully launched an additional nine manned Gemini spacecraft. Each of those launches was classified as a success. While at a minimal cost by today's standards, the problems associated with rendezvous, docking, orbital maneuvering, lifting reentry and landing and operating in a zero-g environment for long durations were addressed and solved on the program. In spite of the long delay in U.S. manned space activities, the Gemini program was an overwhelming success. Each of the major objectives of the program were met as were numerous additional objectives assigned to each mission. Early in the program a goal was established to launch the GLV on three-month centers. That goal was essentially met from the time of the Gemini 3 launch through the launch of all subsequent Gemini spacecraft.

Apollo KSC Industrial Area Facilities

The KSC Industrial Area on Merritt Island was located five miles south of LC-39. The plan for the Industrial Area identified specialized facilities to support spacecraft operations. The Headquarters Building was the Administrative Center for Spaceport operations and the one in which the Director of the Kennedy Space Center and his immediate staff would maintain offices. The MSOB was the largest structure in the Industrial Area and was the future Merritt Island home of spacecraft operations. This multi level facility was to provide an area in which spacecraft assembly, test and checkout and mating operations of each spacecraft element (CM, SM, SLA, and LM) would be performed. Plans for the facility included two 50-foot tall altitude chambers each of which would accommodate the CSM or the LM and would simulate altitudes up to 250,000 feet. Automatic Checkout Equipment control rooms were to be provided to monitor and control sub-system and integrated test of flight hardware located in the MSOB, the VAB or at the Launch Pad. The Central Instrumentation Facility was established as the hub of the Spaceport's data processing operation. It would provide the capability to receive, monitor, process, display and to record information received from the space vehicle during test, launch and flight. The Flight Crew Training Building plan identified the need for a facility in which astronauts and flight controllers could simulate the various phases of CSM and LM manned Apollo space missions. The Fluid Test Support Complex plan included laboratories, shops and service area's to support both LC-39 and the Industrial Area. Fluid and gas sampling analysis for the program would be performed in this facility. The Hypergolic Test Facility was to be the facility in which hazardous test and checkout of hypergolic systems would be performed. The Cryogenic Test Facility would provide the capability to test spacecraft hardware in a super-cooled remotely located environment. The Pyrotechnic Installation Building capabilities would include an area in which hazardous elements of the LES or the ELS could be assembled, installed and aligned. It would also provide the capability to perform a spacecraft weight and balance and to determine its center of gravity. The Ordnance Storage Facility would provide a remote safe storage area for solid fuel motors and pyrotechnic devices.

To Be Continued

About the author: During his 34 years with NAA/Rockwell, Bill served on the Apollo, Space Shuttle and Space Station programs in a supervisory or management position. Half of that time was dedicated to launch operations on Apollo and Space Shuttle at KSC. Since his retirement in 1996, he has served as an aerospace consultant. Bill currently resides in Newbury Park, California with his wondrous wife of 53 years, Penny.

The Hard Way Home

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The dead chicken was starting to smell. After carrying it for several days, 20-year-old Lt. Bruce Carr still hadn't decided how to cook it without the Germans catching him. But, as hungry as he was, he couldn't bring himself to eat it. In his mind, no food was better than raw meat, so he threw it away. Resigning himself to what appeared to be his unavoidable fate, he turned in the direction of the nearest German airfield. Even POWs get to eat. Sometimes. And constantly dodging from tree to tree, ditch to culvert, he was exhausted!

He was tired of trying to find cover where there was none. Carr hadn't realized that Czechoslovakian forests had no underbrush until, at the edge of the farm field, he struggled out of his parachute and dragged it into the woods. During the times he had been screaming along at treetop level in his P-51 "Angels Playmate," the forests and fields had been nothing more than a green blur behind the Messerschmitts, Focke-Wulfs, trains and trucks he had in his sights. He never expected to find himself a pedestrian far behind enemy lines.

The instant antiaircraft shrapnel ripped into the engine, he knew he was in trouble. Serious trouble! Clouds of coolant steam hissing through jagged holes in the cowling told Carr he was about to ride the silk elevator down to a long walk back to his squadron. A very long walk! This had not been part of the mission plan. Several years before, when 18 year-old Bruce Carr enlisted in the Army, in no way could he have imagined himself taking a walking tour of rural Czechoslovakia with Germans everywhere around him. When he enlisted, all he could think about was flying fighters.

By the time he had joined the military, Carr already knew how to fly. He had been flying as a private pilot since 1939, soloing in a $25 Piper Cub his father had bought from a disgusted pilot who had left it lodged securely in the top of a tree. His instructor had been an Auburn, NY, native by the name of Johnny Bruns.

"In 1942, after I enlisted," as Bruce Carr remembers it, *"we went to meet our instructors. I was the last cadet left in the assignment room and was nervous. Then the door opened and in stepped the man who was to be my military flight instructor. It was Johnny Bruns! We took a Stearman to an outlying field, doing aerobatics all the way; then he got out and soloed me. That was my first flight in the military. The guy I had in advanced training in the AT-6 had just graduated himself and didn't know a damned bit more than I did,"* Carr couldn't help but smile, as he remembered. *"Which meant neither one of us knew anything. Zilch! After three or four hours in the AT-6, they took me and a few others aside, told us we were going to fly P-40s and we left for Tipton, Georgia.*

"We got to Tipton, and a lieutenant just back from North Africa kneeled on the P-40's wing, showed me where all the levers were, made sure I knew how everything worked, then said 'If you can get it started, go flyin', just like that! I was 19 years old and thought I knew everything. I didn't know enough to be scared. They didn't tell us what to do. They just said 'Go fly', so I buzzed every cow in that part of the state. Nineteen years old and 1,100 horsepower, what did they expect? Then we went overseas."



Bruce Carr stands by "Angel's Playmate" during WWII.

By today's standards, Carr and that first contingent of pilots shipped to England were painfully short of experience. They had so little flight time that today they would barely have their civilian pilot's license. Flight training eventually became more formal, but in those early days, their training had a hint of fatalistic Darwinism to it: if they learned fast enough to survive, they were ready to move on to the next step. Including his 40 hours in the P-40 terrorizing Georgia, Carr had less than 160 hours flight time when he arrived in England.

His group in England was to be the pioneering group that would take the Mustang into combat, and he clearly remembers his introduction to the airplane. *"I thought I was an old P-40 pilot and the P-51B would be no big deal. But I was wrong! I was truly impressed with the airplane. I mean REALLY impressed! It flew like an airplane. I FLEW a P-40, but in the P-51, I was PART OF the airplane, and it was part of me. There was a world of difference."*

When he first arrived in England, the instructions were, "This is a P-51. Go fly it. Soon, we'll have to form a unit, so fly." A lot of English cows were buzzed. *"On my first long-range mission, we just kept climbing, and I'd never had an airplane above about 10,000 feet before."*

"Then we were at 30,000 feet and I couldn't believe it! I'd gone to church as a kid, and I knew that's where the angels were and that's when I named my airplane 'Angels Playmate.'



"Angel's Playmate"

"Then a bunch of Germans roared down through us, and my leader immediately dropped tanks and turned hard for home. But I'm not that smart. I'm 19 years old and this SOB shoots at me, and I'm not going to let him get away with it.

"We went round and round, and I'm really mad because he shot at me. Childish emotions, in retrospect. He couldn't shake me, but I couldn't get on his tail to get any hits either.

"Before long, we're right down in the trees. I'm shooting, but I'm not hitting. I am, however, scaring the hell out of him. I'm at least as excited as he is. Then I tell myself to calm down.

"We're roaring around within a few feet of the ground, and he pulls up to go over some trees, so I just pull the trigger and keep it down. The gun barrels burned out and one bullet, a tracer, came tumbling out and made a great huge arc. It came down and hit him on the left wing about where the aileron is. He pulled up, off came the canopy, and he jumped out, but too low for the chute to open and the airplane crashed. I didn't shoot him down, I scared him to death with one bullet hole in his left wing. My first victory wasn't a kill; it was more of a suicide."

The rest of his 14 victories were much more conclusive.

Being a red-hot fighter pilot, however, was absolutely no use to him as he lay shivering in the Czechoslovakian forest. He knew he would die if he didn't get some food and shelter soon.

"I knew where the German field was because I'd flown over it, so I headed in that direction to surrender. I intended to walk in the main gate, but it was late afternoon and, for some reason, I had second thoughts and decided to wait in the woods until morning. While I was lying there, I saw a crew working on an Fw 190 right at the edge of the woods. When they were done, I assumed, just like you assume in America, that the thing was all finished. The cowling is on. The engine has been run. The fuel truck has been there. It's ready to go. Maybe a dumb assumption for a young fellow, but I assumed it. So, I got in the airplane and spent the night all hunkered down in the cockpit.

"Before dawn, it got light and I started studying the cockpit. I can't read German, so I couldn't decipher dials and I couldn't find the normal switches like they were in American airplanes. I kept looking, and on the right side was a smooth panel. Under this was a compartment with something I would classify as circuit breakers. They didn't look like ours, but they weren't regular switches either. I began to think that the Germans were probably no different from the Americans in that they would turn off all the switches when finished with the airplane. I had no earthly idea what those circuit breakers or switches did, but I reversed every one of them. If they were off, that would turn them on. When I did that, the gauges showed there was electricity on the airplane. I'd seen this metal T-handle on the right side of the cockpit that had a word on it that looked enough like 'starter' for me to think that's what it was. But when I pulled it, nothing happened. Nothing.

"But if pulling doesn't work, you push. And when I did, an inertia starter started winding up. I let it go for a while, then pulled on the handle and the engine started."

The sun had yet to make it over the far trees and the air base was just waking up, getting ready to go to war. The Fw 190 was one of many dispersed throughout the woods, and at that time of the morning, the sound of the engine must have been heard by many Germans not far away on the main base. But even if they heard it, there was no reason for alarm. The last thing they expected was one of their fighters taxiing out with a weary Mustang pilot at the controls. Carr, however, wanted to take no chances.

"The taxiway came out of the woods and turned right towards where I knew the airfield was because I'd watched them land and take off while I was in the trees.

"On the left side of the taxiway, there was a shallow ditch and a space where there had been two hangars. The slabs were there, but the hangars were gone, and the area around them had been cleaned of all debris. I didn't want to go to the airfield, so I plowed down through the ditch, and when the airplane started up the other side, I shoved the throttle forward and took off right between where the two hangars had been."

At that point, Bruce Carr had no time to look around to see what effect the sight of a Focke-Wulf erupting from the trees had on the Germans. Undoubtedly, they were confused, but not unduly concerned. After all, it was probably just one of their maverick pilots doing something against the rules. They didn't know it was one of OUR maverick pilots doing something against the rules.

Carr had problems more immediate than a bunch of confused Germans. He had just pulled off the perfect plane-jacking; but he knew nothing about the airplane, couldn't read the placards and had 200 miles of enemy territory to cross. At home, there would be hundreds of his friends and fellow warriors, all of whom were, at that moment, preparing their guns to shoot at airplanes marked with swastikas and crosses-airplanes identical to the one Bruce Carr was at that moment flying. But Carr wasn't thinking that far ahead. First, he had to get there, and that meant learning how to fly the airplane.

"There were two buttons behind the throttle and three buttons behind those two. I wasn't sure what to push, so I pushed one button and nothing happened. I pushed the other and the gear started up. As soon as I felt it coming up and I cleared the fence at the edge of the German field, I took it down a little lower and headed for home. All I wanted to do was clear the ground by about six inches, and there was only one throttle position: full forward.

"As I headed for home, I pushed one of the other three buttons, and the flaps came part way down. I pushed the button next to it, and they came up again. So I knew how to get the flaps down. But that was all I knew. I can't make heads or tails out of any of the instruments. None. I can't even figure how to change the prop pitch. But I don't sweat that, because props are full forward when you shut down anyway, and it was running fine."

This time, it was German cows that were buzzed, although, as he streaked across fields and between the trees only a few feet off the ground, that was not the intent. Flying over 350 miles an hour below treetop level, he was trying to be a difficult target, but as he crossed the lines, he wasn't difficult enough.

"There was no doubt when I crossed our lines because every SOB and his brother who had a .50-caliber machine gun shot at me. It was all over the place, and I had no idea which way to go. I didn't do much dodging because I was just as likely to fly into bullets as around them."

When he hopped over the last row of trees and found himself crossing his own airfield, he pulled up hard to set up for landing. His mind was on flying the airplane.

"I pitched up, pulled the throttle back and punched the buttons I knew would put the gear and flaps down. I felt the flaps come down, but the gear wasn't doing anything. I came around and pitched up again, still punching the button. Nothing was happening and I was really frustrated."

He had been so intent on figuring out his airplane problems, he forgot he was putting on a very tempting show for the ground crew.

"As I started up the last time, I saw the air defense guys ripping the tarps off the quad .50s that ringed the field. I hadn't noticed the machine guns before, but I was sure noticing them right then.

"I roared around in as tight a pattern as I could fly and chopped the throttle. I slid to a halt on the runway and it was a nice belly job, if I say so myself."

His antics over the runway had drawn quite a crowd, and the airplane had barely stopped sliding before there were MPs up on the wings trying to drag him out of the airplane by his arms. They didn't realize he was still strapped in.

"I started throwing some good Anglo-Saxon swear words at them, and they let loose while I tried to get the seat belt undone, but my hands wouldn't work and I couldn't do it. Then they started pulling on me again because they still weren't convinced I was an American.

"I was yelling and hollering; then, suddenly, they let go, and a face drops down into the cockpit in front of mine. It was my Group Commander, George R. Bickel.

"Bickel said, 'Carr, where in the hell have you been, and what have you been doing now?'" Bruce Carr was home and entered the record books as the only pilot known to leave on a mission flying a Mustang and return flying a Focke-Wulf. For several days after the ordeal, he had trouble eating and sleeping, but when things again fell into place, he took some of the other pilots out to show them the airplane and how it worked. One of them pointed out a small handle under the glare shield that he hadn't noticed before. When he pulled it, the landing gear unlocked and fell out. The handle was a separate, mechanical uplock. At least, he had figured out the important things. Carr finished the war with 14 aerial victories after flying 172 missions, which included three bailouts because of ground fire. He stayed in the service, eventually flying 51 missions in Korea in F-86s and 286 in Vietnam, flying F-100s. That's an amazing 509 combat missions and doesn't include many others during Viet Nam in other aircraft types.

What makes a fitting ending to this story is that there is no ending. Bruce Carr was still actively flying and routinely showing up at air shows in a P-51D painted up exactly like Angel's Playmate. The original Angel's Playmate was put on display in a museum in Paris, France, right after the war. There is no such thing as an ex-fighter pilot. They never cease being what they once were, whether they are in the cockpit or not. There is a profile into which almost every one of the breed fits, and it is the charter within that profile that makes the pilot a fighter pilot-not the other way around. And make no mistake about it. Col. Bruce Carr was definitely a fighter pilot.



The Fw 190 in which Bruce Carr made his way home.

Stallion 51 Note:

We are sad to say that Bruce Carr, long-time friend and guest of Stallion 51, passed away in April 1998 at the age of 74. We are proud to have known this true American hero and fighter pilot.

Editor's Note: The NAAR Bulletin is grateful to Angela West of Stallion 51 for permission to reprint this account of a fantastic P-51 pilot and his extraordinary adventure behind enemy lines.

WESTERN MUSEUM OF FLIGHT PLANS NAA DAY

The Western Museum of Flight is planning to celebrate a North American Aviation Day on Saturday, October 9th in recognition of the 70th Anniversary of the first flights of the P-51 Mustang fighter and the B-25 Mitchell bomber. October was the month that the first P-51 (NA73) was flight tested. To make the event even more memorable, the Museum's operational P-51 will be dedicated to Edgar Schmued, the Chief Designer responsible for the design of the P-51. Also, on display will be an F-86F Sabre jet fighter that should bring many memories to the NAA visitors. To complete this celebration, arrangements are being completed to display other NAA aircraft including several T-6 Texan trainers, a T-28 Trojan trainer, a B-25 Mitchell bomber, a Navion, and hopefully a Sabreliner. The Museum is inviting all organizations and individuals interested in participating by displaying their airplanes and NAA memorabilia, to contact the museum. The museum is located on the south side of the Torrance Airport (Zamperini Field). The address is 3315 Airport Drive, phone no. (310) 326-9544, website www.wmof.com. There will also be many other vintage aircraft and jets on display. Assisting the museum in this noble endeavor is our NAA Retiree, Earl Theaker. Earl can be reached at (310) 326-3180 or *etheaker@sbcglobal.net.*

The 48th Annual Bald Eagles Reunion

Photos by Lee French



Ed "Moke" Mokeslaveskas



Featured Speaker
Major Scott Higgenbotham



Don Pehrson



Bud Richardson, Clyde Sampson, and Bob Hall



Cindy Macha



Susan Boldt and Pat Cunningham



Carol Landry and Linda Ford



Sam Iacobellis, Nissen Davis, and Elmer Dittus



Gene Salvay



Bill Edson, Elton Kinkaid, and Don Thompson



Bridgett Vavasseuer



Penny and Tom Ellis



Peggy and Dale Stinson



Pat Harling and Ann DeBriere



Bruce Flood, Bob Cunningham, Dutchie Langon, and Jack Grimes



Doug Devine and Joyce Anthony



Theodora and Leonard Replogle and Charles Wisdom



P.J. and Pete Mazzagatte



Laura and Morris Loyd



Sonnie Robertson and Lou Tiberio



Major Scott Higgenbotham

Congratulations and Best Wishes to

Gerald and Esther Funk of Paonia, Colorado celebrating their 67th Wedding Anniversary

Harold and Betty Hayes of Central Point, Oregon celebrating their 66th Wedding Anniversary

Eugene and Shirley Somers of Idyllwild, California celebrating their 60th Wedding Anniversary

Harold and Bonnie Nissen of Marion, Iowa celebrating their 58th Wedding Anniversary

Otto and Dorothy Juelich of Columbus, Ohio celebrating their 57th Wedding Anniversary

Charles and Barbara Brooker of Perris, California celebrating their 50th Wedding Anniversary

On the Early Retirement of the Space Shuttle

by George W. Jeffs

A Symbol:

An in-space ballerina and hypersonic flying marvel, the Space Shuttle Orbiter is almost impossible for others to duplicate and continues to generate international admiration and respect for U.S. technical capabilities.

Full Potential Not Yet Realized:

The multi-functional Orbiter has performed "as designed" on all assignments including reentry and a key role in the International Space Station (ISS) assembly. Like any new manned system, as crews and engineers become more familiar (like a helicopter) performance "in the box" improves and extending-the-box opportunities are identified. So far the Orbiter has operated generally within the box.

Too Young for Retirement:

Each remaining Orbiter has many missions and years of life remaining. The Orbiter was designed for a one hundred-mission life with a factor of four (i.e. 400 flight potential). It has experienced low flight rates and has not been structurally overloaded (maximum loads occur during the boost phase and high wind shear situations have been avoided through pre-flight meteorological observations) and receives a complete examination and any necessary refurbishment between each flight.

The System is Safe for Continued Manned Flights:

No critical failures have originated from within the triply redundant Orbiter itself but like any spacecraft designed for light weight, it is vulnerable to abuse (e.g. Solid Rocket Boosters, O-rings, External Tank insulation debris); these are now known and addressable problems. The Space Shuttle Main Engines (SSMEs) were my principal safety concern through the development years but their flight record has been excellent and it may be that the integrity of recovered, refurbished rocket engines is as good as or even better than new ones. Some rocket engine incipient failures may lie undetected in ocean graves.

Real Usability Through "Landing With Dignity":

Turnaround man-hours are costly for the Orbiter, not the least demanding being the heat shield preparation and changes are continually being made to improve the situation. Even so, this relatively light weight, first generation radiant heat shield is itself reusable and obviates having to pay for a new vehicle and other ancillary costs such as ocean recovery for every flight. Note: In depth reviews of "flown" Apollo command modules concluded that second flights of the hardware would be too costly at that time.

New Space Initiatives Depend on the Orbiter for Identification and Pursuit:

The on-orbit assembly option for a deep space manned system became more viable upon completion of the ISS using the Orbiter. An "Orbiter" segment of a deep space system would be used in assembly activities, on-orbit transfers, tug functions and most importantly for the crew Earth-to-orbit and orbit-to-Earth transfer. Reliance on an Orbiter for re-entry would eliminate configuration constraints on size and shape and the weight of items such as parachutes, heat shields and landing impact structure and the energy needed to transport this otherwise useless added weight throughout the entire deep space mission. This approach essentially would trade-off these advantages against the development of an additional propulsion module for return from deep space to high/low Earth orbit. The present Orbiter would be a key mechanism in the early development of such an on-orbit assembled system.

The Shuttle Continues to be an Intriguing Candidate for "Commercialization":

The system is presently operational. Its payload-to-orbit delivery and other capabilities are well documented. Its risks are known and assessable for payload insurance and crew-safety considerations and industrial elements are already doing much of the work in many areas. Bailing, leasing and/or other type of agreement for use of government equipment (Orbiters, pads, control centers, etc.) is probably feasible in some arrangement. Needed is an industry, NASA-government, Congressional meeting of the minds on all related elements including government flight requirements, (e.g. ISS servicing) and commercial pricing policies. If such a government hand-off to industry could be affected it would, of course, keep the Shuttle Program available for another decade or two should presently unforeseen government needs arise (even today it would be most helpful to have Apollo supply and rescue vehicles that serviced Skylab available for use on the ISS).

U.S. Taxpayers Have Not Yet Realized Their Full Return-On-Investment from the Shuttle System:

- It really works; it is not just a briefing chart promise
- It has much life remaining and could be the key to the identification and development of new systems
- It is man-rated and safe—probably as safe as any manned system will be—no others will get over one hundred flights down the learning curve
- The infrastructure is in place and operational and has provided industry through extensive, hands-on participation with the depth of training necessary to assume total system accountability
- To replace the Orbiter capabilities will require decades of time and billions of dollars

Decommissioning the Space Shuttle Should be Postponed Indefinitely

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About the Author: George Jeffs is a pioneer of manned space flight. He was chief engineer for several projects before becoming President of Space Division at North American Aviation/Rockwell International during the Apollo and the Space Shuttle Programs. Subsequently, he became President of Space and Energy Operations (including Shuttle Orbiter, Integration and Space Shuttle Main Engines) at Rockwell. He retired in 1991 with 44 years of service. Mr. Jeffs is a helicopter and fixed-wing pilot with multiengine and instrument ratings.

Contrails From The Past

by Ed Rusinek

Dear Ed,

The news that J.O. Roberts died, Summer 2009 Issue, brought back memories of a project we both had a hand in. J.O. was the project pilot on the F-86 with a rocket engine attached. The engine was the AR2-3, designed and built by Rocketdyne. I was the engineer in charge of the program, responsible for all ground and flight tests. Although the engine could produce over 6,000 pounds of thrust, I could lift it with one hand.

NAA developed this program because Japan wanted to update its Air Defense arm. At the time, Japan was already building the F-86 and this would enhance the ability to rapidly intercept enemy bombers at high altitude.

The engine was attached under the F-86 in a pod. It could be started, shutoff and restarted and throttled by the pilot. It ran on 90% H_2O_2 (hydrogen peroxide) which was carried in two pressurized 130-gallon external wing tanks. The H_2O_2 was passed through a silver screen catalyst in the engine and was broken down into superheated steam and pure oxygen. JP-4 fuel from the F-86 was then added, which ignited and provided the thrust.

The F-86 could only go supersonic in a dive. With the rocket engine at full throttle, the F-86 could attain speeds up to Mach 1.4 at 35,000 feet. With two Sidewinder missiles on the wings, this made the F-86 a very good interceptor.

Japan sent several test pilots to fly and evaluate this configuration. To our disappointment, they opted for the Lockheed F-104. Rocketdyne convinced the Air Force to install the AR2-3 on an F-104 at Edwards AFB. Chuck Yeager flew it on one flight and set an altitude record for the F-104. However, since the airplane didn't have ballistic controls, he almost lost the airplane. He was very lucky!

—Lowell Masley, Sun City, AZ



J. O. Roberts taking off in a rocket-assisted F-86 at the NAA Palmdale facility

Ed's Ans.: We've had a letter once before about this unusual F-86 but not with the splendid details that you provided. Thank you Lowell!

Dear Ed,

In the late 1940s, the USAF needed an aircraft to flight test the second generation of jet engines. The only aircraft available to do this was the NAA B-45 bomber. Our Engineering came up with an ingenious design—an extendable-retractable pylon in the bomb bay. With the test engine retracted against the bomb bay, there was barely enough clearance for take-off and landing.

Our flight test crew consisted of Dan Darnell as the test pilot, Bud Poage as the test engine operator and I as the copilot-flight test engineer. We flew the six miles from Muroc North Base to what is now the South Base at Edwards. But why fly? Why not taxi over on Rogers Dry Lake? In those days, the Santa Fe R.R. cut across the north half of the lakebed—it was cheaper to fly than to ramp over the rail bed. A few years later when the rocket planes and X-planes could hardly pinpoint their landings, and needed the entire 12 miles long lakebed, the railroad was rerouted north of the base.

We landed at the Main Base and Dan taxied to the pad and pit where the first X-ships were loaded under the B-29 and B-50 mother ships. The extension and retraction of the test engine was performed using either primary or secondary hydraulic systems. You could feel the mild turbulence "clean-up" when the test engine was extended and the acceleration as Dan throttled back the four regular jet engines.

One final test remained, checking the "Emergency Retract System". The system consisted of a hand pump located in an awkward position near the navigator's station where you couldn't get your body behind the pump. So I pumped until I could no longer feel my right arm. Then Bud Poage pumped to sheer exhaustion. We took turns until the test engine was stowed. True! The system was not as sophisticated as today's redundant hydraulic systems—but it worked!

—Art Wagner, Lancaster, CA



The five engined B-45 with the test engine extended from the bomb bay

Ed's Ans.: One of the great joys of being Editor of the Bulletin is to read these vignettes about how you persevered to get the tasks done. Nothing was impossible—it just may have taken a little longer to solve and to resolve.

The Silent Majority

by Stan Guzy



MARTIN, ALBERT C., 86 – died in Cocoa Beach, FL on March 14, 2010. Al joined NAA in 1951 as a flight test engineer on the Navaho Project in Downey. In 1955, he transferred to Florida as Navaho G-28 Test Conductor. He returned to Downey in 1960 to lead Saturn S-II Test Operations and in 1965 went back to Florida as the Director of S-II Launch Operations. Upon completion of the Apollo Program, he returned to Downey as Chief Engineer Shuttle Systems Integration and later as Chief Engineer Orbiter DDT&E. His final move to Florida came in 1982, retiring in 1990 as Vice President, Florida Operations. He ended his career with NAA/RI and the KSC as a respected leader. During WWII, Al was a B-26 Marauder bomber pilot with the 9th Air Force in Europe. He had graduated from the University of Texas with an aero engineering degree. Al was preceded in death in 1994 by his wife of 49 years, Helen. He subsequently remarried in 1995 to "Dowee", a high school friend. (This is the bio that Al wrote himself for the Retirees Bulletin in 2002. It is added here because his many friends will be trying to remember him in his many roles with NAA.)

MAHURIN, WALKER "BUD", 91 – died May 11, 2010 at his home in Newport Beach, CA. A tenacious fighter pilot, he was the only Air Force pilot to shoot down enemy aircraft in the Europe, the Pacific and in Korea. In November 1943, he became the first pilot in the European Theater of to shoot down 10 enemy planes. In 1944 he became commander of the 3rd Fighter Squadron in the Philippines. Flying a P-51 Mustang, he scored his only aerial victory in the Pacific. He went on to score 3.5 aerial victories in Korea, flying an F-86 Sabre jet with the 51st Fighter Interceptor Wing. In 1952, he was shot down by ground fire, crash landed and spent 16 torturous months as a POW. After serving with the Air Force, he joined NAA at Downey in 1956. He is survived by his wife of 40 years, Joan.

WENDT, GUENTER, 85 – died at home on Merritt Island, FL on May 3, 2010. The "Pad Fuhrer" as he was known, was the original pad leader for NASA's Manned Space Program and was the last man the Apollo astronauts saw before launching to the moon. It was his commitment to their safety that earned Guenter the respect of the astronauts. He oversaw their safety through the Apollo program and beginning flights of the Space Shuttle. He retired from the Space Program in 1989, after serving on the accident review board convened at Kennedy Space Center to investigate the loss of Space Shuttle *Challenger*.

AUMILLER, RUSSELL "RED", – passed away on February 9, 2010 in Gilbert, AZ. Red hired in at LAD at the age of 18 in 1954 and retired from Space Division in 1988 as an outside contact man with 35 years of service. He is survived by his wife of 59 years, Marlene.

CARSON, HASKEL E., 84 – left this world on May 6, 2010 from undisclosed causes. After two separate stints of service in the Navy during WWII and Korea, Ed obtained his degree in physics and eventually joined NAA/RI. He served as project manager on several programs including the Peacemaker Missile and the Rail Garrison prior to his retirement in 1986. He made many friends and kept in contact even after retirement. He is survived by his wife of 64 years, Ruby.

CHAMBERLAIN, WAYNE G., 89 – of Missoula, MT died on February 14, 2010. Wayne joined LAD in 1940 and subsequently worked on the X-15, Mercury, Apollo, and B-1B projects. He retired from the Sabreliner Division in St. Louis in 1985 with 41 years of service.

COMER, BETTY M., 88 – passed away on July 11, 2009 just a few weeks short of her 89th birthday. She retired from Rocketdyne in 1983 after 25 years of dedicated service. Betty's husband also worked at Rocketdyne and her son works there currently. They have a combined cumulative service of over 65 years with NAA/RI.

CRYSTAL, SIDNEY M., 88 – from Santa Clarita, CA departed this life on March 10, 2010. He worked as a graphics engineer in the Prospective Drafting Design Support group at NAA, Rocketdyne and Boeing. He retired from LAD in 1981 after 20 years of service on projects such as Gemini, Apollo and the B-1 bomber. He is survived by his wife of 62 years, Virginia.

DAPICE, JOSEPH, 88 – of Perris, CA, passed away on March 19, 2010. A World War II veteran, Joseph served for 29 years at North American Aviation/Rockwell. He is survived by his wife Margaret.

DEVITO, ORLANDO "JERRY", 87 – died in Rancho Palos Verdes, CA on February 7, 2010. Jerry retired from North American Aviation/Rockwell in 1983 with 35 years of service. He is survived by his wife Eleanor.

ENGEBRETSON, HAROLD J. "HAL", 84 – a resident of Yorba Linda, CA and Longbranch, WA, Hal succumbed to cancer on April 6, 2010. He joined NAA in 1954 after obtaining his degree in electrical engineering from the University of Washington and serving in the Navy. For many years, he was considered a specialist in inertial navigation systems at Autonetics with emphasis on electro-mechanical and gyroscope systems. At NAA he was described as a laid-back thinker who preferred science to managing. He continued consulting work well into his 80s. He is survived by his wife, Jacqueline.

FLATTEN, ORRIS H., 85 – passed away peacefully of respiratory failure on October 13, 2009 surrounded by his family. Orris, a Stanford MSEE grad, joined the Aerophysics Lab in 1952 beginning an outstanding 29-year career with NAA/Autonetics in the Minuteman Auto Collimator and precision alignment verification groups. He also invented and patented the infusion pump for intravenous machines used in hospitals worldwide. Orris is survived by his wife of 54 years, Ann.

GIBBS, JESSE B., 79 – formerly of Orange, CA, died on April 19, 2010 in Las Vegas, NV from undisclosed causes. Jesse retired from Autonetics Navigation Systems Division after 35.5 years of service.

GRIFFEN, CHARLES D., 78 – a resident of Mission Viejo, CA died on March 8, 2010 from undisclosed causes. He was a USC graduate and proudly served in the Army during the Korean conflict. He retired from Satellite Systems Division in 1989 after 25 years of service. He was preceded in death by his first wife, Margaret, and is survived by his current wife, Jan.

HATCH-HIATT, MURIEL PATRICIA "PATTI", 82 – died on December 25, 2009 at her home in Oceanside, CA after a brief illness. Heeding her mother's advice, Patti joined NAA on January 23, 1945, a day after her 18th birthday. She began in Contract Terminations and Claims and moved on to Public Relations. In 1951, she became executive secretary to Mr. Lee Atwood, a position she held for 27 years. She worked closely not only with Mr. Atwood but with Mr. Dutch Kindleberger in the expansion into the Space Age. She retired in 1981 with 36 years of service. Patti and her husband, Richard, were married for 57 years until his death on December 2005.

HORTON, JAMES E., 81 – died on March 18, 2010 at his home in Los Angeles, CA of complications resulting from dialysis and lung cancer. James retired in 1986 after 31 years of dedicated service in the NAAO/LAD Tooling Department as the manager of Plastics and Bonding. He was well respected in management circles. His wife, Hilda, survives him.

HULICK, RALPH, – the Bulletin was returned stamped "Deceased". Ralph retired from Autonetics-Strategic Systems in 1993 with 39 years of service.

JACOBSON, EDWARD G., 70 – passed away peacefully at his home in Menifee, CA on March 17, 2010. Ed retired from Space Division in 1994 after 35 years of service. He was preceded in death by his wife, Patricia Ann.

JUDSON, GILBERT E. "GIL", 93 – passed away in Grants Pass, OR on March 12, 2010. Gil managed the salvage crib during the B-1B program. He retired with 32 years of service.

KNOWLDEN, FLOYD H., 83 – died on April 11, 2010 from undisclosed causes. Floyd earned a B.A. in engineering at UCLA after serving in the Army Air Force during WWII. He worked on the Saturn, Apollo and Space Shuttle programs during his 30 years at NAA/RI. He retired at 82 after an additional 27 years at the Aerospace Corporation. He is survived by his loving wife of 35 years, Joanne.

LINDSAY, JOHN D., 84 – of Fullerton, CA died on March 20, 2010. A WWII veteran, John graduated from Oklahoma A&M with a degree in electrical engineering and joined Autonetics as an aerospace engineer. He is survived by his loving wife, Lois.

McDERMOTT, RAYMOND, 79 – of Torrance, CA passed away on February 16, 2010 after a very difficult battle with cancer. Ray joined the Air Force in 1948 and then moved to California where he served for 18 years at NAA as a firefighter and security sergeant. Ray is survived by Myrtle, his loving wife of 59 years.

METZNER, ROBERT J. – passed away on January 25, 2010 in Lancaster, CA after a severe stroke. Bob was a Rocketdyne test engineer who helped develop fuel efficiency techniques for the Apollo project. He retired from Rocketdyne in 1998 after 35 years of service.

MORAN, CORNELIUS P. "C.P.", 78 – died August 20, 2009 in Fullerton, CA from undisclosed causes. He served in the U.S. Marine Corps during the Korean conflict and returned to California where he earned his electronic engineering degree. His expertise at Autonetics was instrumental in the development of the first computerized on-board navigational system for the Space Shuttle. C.P. is survived by his wife, Lucille.

MULGREW, DAVID B., 88 – died in El Monte, CA on May 19, 2010. David was a Purchasing Manager when he retired from LAD in 1959 with 19 years of service to form his own aerospace company, Mulgrew Aircraft Components.

NADLER, DON, 82 – passed away on March 17, 2010 in California. He worked at NAA/RI as an electronic engineer for 32 years. Following retirement he began his own firm, Pearl Electric, for ten more years. Don is survived by his wife of nearly 60 years, Joan.

NEWTON, PETER R., 80 – died on February 24, 2010 of undisclosed causes. Born in Berlin, Germany, he immigrated to the USA in 1939, earned a B.S. from UCLA and an MBA in chemistry from USC. He served as a sergeant in the U.S. Marine Corps during the Korean War. Peter retired from NAA/RI as a chemist in 1992. His wife, Lavona, recently preceded him in death.

PIERSON, MALCOLM J., 80 – died at home in Fullerton, CA of cancer. Mal retired from Autonetics after many years of service as a facilities manager. He is survived by his wife Janet.

RILEY, JO ANN, 73 – died at Mountain Home, Arkansas on February 6, 2010 from undisclosed causes. She had retired from Autonetics' Quality Assurance in 1992 after 35 years of service.

SABEY, RICHARD B., "DICK", 82 – passed away in Warren, OH on November 11, 2010. He retired from LAD in 1982 after 34 years of service as a supervisor in Technical Illustrations. He is survived by his wife, Dottie.

SHANNON, RALPH A., 83 – a long time resident of Yorba Linda, CA died after a courageous battle with cancer on November 30, 2009. Ralph served for 31 years at Autonetics and was a key member of the proposal teams. He is survived by his loving wife of 59 years, Susan. She is also an NAA retiree with 30 years of service.

UNGER, ARNOLD J., 83 – a long time resident of Fullerton, CA, died on March 29, 2010. Arnold had been employed as an electrical engineer at NAA/RI Autonetics where he was instrumental in the design of missile guidance systems and satellite components. He retired in 1988 as the basing manager for the MX (Peacekeeper) missile after 24.5 years of service.

VANDER MEER, GERRITT T., 97 – death occurred on May 10, 2010. Retired as a production engineer from NAA/RI Autonetics with 35 years of service on military fighter programs, experimental aircraft, Minuteman missiles, and the B-1 bomber. He was preceded in death by his wife, Marian.

VAUGHT, DONALD L. 84 – Don lost his long, hard battle with heart and lung disease on April 18, 2010 at Hoag Hospital in Newport Beach, CA surrounded by loved ones. A U.S. Army veteran, he retired from NAA/RI after a successful 31-year career as an aerospace engineer. He is survived by his wife of 51 years, Georgine.

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North American Aviation Retirees Bulletin
"WHERE THE BEST NEVER REST"

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After the Apollo 1 fire, the North American Aviation management at the Kennedy Space Center was reorganized with several new members from Martin and Convair. In 1968, this was the North American Aviation Management Team at KSC during a weekly status briefing: (from left to right) Burt Yancey, John Hansel, Stan Taylor, Ray Pyle, Buzz Hello, Hank Kuznicki, Tom O'Malley, Chuck Wall, Ted Carey, Bill Edson, Chick Davis, Neil Mullins, and Dale Anderson.

NORTH AMERICAN AVIATION
Retirees Bulletin
"Where The Best Never Rest"

Fall 2010

Inside:

NAA AT CAPE CANAVERAL AND KSC – PART IV by Bill Edson

THE APOLLO 1 SPACECRAFT FIRE INVESTIGATION by Larry Korb



Photo from the John Lambert Collection

The Fifteenth Air Force began flying missions out of the Foggia, Italy region on November 2, 1943. The 15th AF consisted of five bomb wings and two fighter wings—the 305th and the 306th Fighter Wing. The four Fighter Groups of the 306th FW—the 31st FG, the 52nd FG, the 325th FG, and the 332nd FG—were equipped with the P-51D. With their long-range capabilities, the P-51s were able to perform bomber escort and fighter sweeps reaching targets in southern France, Germany, Poland, Czechoslovakia, Hungary, Romania, and Bulgaria. A familiar face in those missions was our NAA Test Pilot, Captain James Brooks, leading the 307th Fighter Squadron, 31st FG. Celebrating their Victory in Europe in a flight over the Alps in 1945, are representative P-51Ds from the four Fighter Groups of the 306th FW: from top to bottom, the 31st FG, 52nd FG, 332nd FG, and the 325th FG.

NORTH AMERICAN AVIATION
Retirees Bulletin

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Dear NAA Retirees Bulletin Subscriber

As Editor, we often admire but do not get overly excited about an article submitted to us for publication. However, in this issue you will read about the Apollo I fire investigation and it will make you rage and cry at the same time! It is written by an NAA participant in the accident investigation whose credentials are impeccable! After fifty years, Larry Korb has delved back into his memory and his log books to put together an amazing study of what happened and what led up to this horrific loss of three good men. Our company, North American Aviation, had to assume full blame for this tragedy! As a result: the program suffered a prolonged delay in schedule, confidence in our company was shaken, management was restructured, lives and careers were destroyed. But you read Larry's report and you decide!

To complement the Apollo I fire investigation article, Bill Edson's fourth segment of his series about NAA Operations at Cape Canaveral and the Kennedy Space Center provides the introduction of the Apollo Program at KSC.

The passing of Joe Beerer, Silent Majority, brings back a fond memory of him. I started with NAA as a Stressman B in February 1951 at the Aerophysics Laboratory in Downey. The Engineering Department was composed of a fantastic array of people that Central Casting in Hollywood would be hard pressed to duplicate. There were the original Vultee engineers that I think came with the building. There were the engineers transferred from LAD that included some of the original folks from Dundalk including a German fighter pilot from World War I. There was the brilliant Polish scientist who made the first parachute jump in Poland in the early 1900s and still walked with a convincing limp. There were some British engineers that immigrated to California via Canada, which included a Royal Navy pilot who had attacked the Bismarck in an ancient Swordfish torpedo bomber. There were the brilliant German scientists from Peenemunde. There were the WWII veterans that received their degrees on the GI Bill. Finally, there were the Ph.D.s from Academia. The atmosphere resembled a relaxed college campus although we were working on a top secret project, the Navaho. Salaried employees drifted in for an hour after the start time and started to amble out an hour before quitting time. Although, my only previous experience working in a large group was my service in the Army, I felt that this was bound to come to an abrupt end. One morning, a man appeared at the main gate. He told the guards that he was THE MAN and to start taking down names of all the late comers and the names of their supervisors. In three days, there was a complete restructuring in the way Engineering was performing. Punctuality and responsibility became the cornerstone of the operation. Oh yes! The man's name was Joe Beerer.

NAA at Cape Canaveral and KSC – Part IV

by Bill Edson

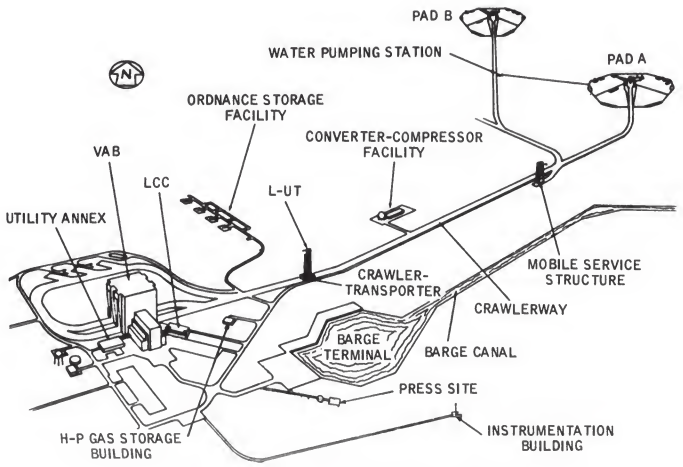
Apollo KSC LC-39 Area Facilities

The Kennedy Space Center (KSC) of the 20th Century came to life in the early 1960s as the facilities required to process and launch lunar bound Saturn V rockets assumed their individual identities. The Launch Complex-39 (LC-39) development plan called for construction of an enclosed facility 525 feet high, 716 feet long and 518 feet wide, called the Vertical Assembly Building (VAB). In 1966, the VAB was one of the largest buildings in the world. The facility consisted of a low bay area with eight assembly and checkout cells for each of the rocket propulsive stages and the Instrument Unit (IU). Four separate bays within a high bay area could each be utilized for stage vertical assembly and for checkout of a stacked Saturn V vehicle. Within each high bay, work platforms provided 360° access to each stage. The VAB provided 141 lifting devices ranging from one-ton hoists to 250-ton bridge cranes. Once the VAB was opened, sixteen high-speed elevators serviced the more than 3,000 personnel who occupied office areas adjacent to the hardware for which they were responsible.

Adjacent to the VAB, a four-level Launch Control Center (LCC) provided four firing rooms from which engineering personnel monitored and controlled automated test, checkout and pre-launch/launch activities in the VAB or at the Launch Pads. The 445-foot tall Mobile Launcher (ML) was the key to the mobility that characterized LC-39 operations. It had two primary functions: to provide a Mobile Launch Platform (MLP) supported on pedestals on which the Saturn V could be assembled and launched, and to provide on that platform a Launch Umbilical Tower (LUT) that supported nine swing arms. The swing arms provided umbilical or personnel access to the individual launch vehicle stages during propellant servicing and checkout operations. The MLP also provided pre-ignition vehicle hold down arms, first stage ground system interfaces for propellant servicing and a computer checkout capability that interfaced with the RCA-110 computer system in the LCC firing room. A 45-foot square opening was built into the platform to accommodate rocket exhaust at liftoff.

The ML provided 17 work platforms to accommodate additional vehicle access needs. Two high-speed elevators provided access to the work platforms. Three MLs were provided to support the program. To lift and to transport the ML/Saturn V mated configuration, the Crawler Transporter (CT), an adaptation of a self-propelled strip coal mining shovel was chosen for the job. The massive machine itself weighed 2,400 tons. It was 131 feet long and 114 feet wide and under full load traveled at 1-2 mph. To move from the VAB to the Launch Pad took seven hours. Two CTs were manufactured to support the program. A new especially constructed road, called the Crawlerway, was built to support the weight of the CT and its stack as it moved from the VAB to the Launch Pads. To meet anticipated launch rates, two Launch Pads were built, each comprised of a concrete hard stand, support pedestals for the MLP, and a flame deflector and flame trench to deflect heat at launch away from the vehicle and pad. Operational areas were provided on which specialized ground support equipment could be located.

Remote from the pad surface were liquid oxygen, hydrogen and kerosene propellant storage facilities. In the event of an emergency, an egress capability was provided for the flight crew and for the contractor furnished closeout crews. The function of the Mobile Service Structure (MSS) was to provide 360° of enclosed access platforms to the Apollo spacecraft with some access to selected stage areas of the Saturn V while the vehicle was stacked at the pad. The 410-foot tall MSS was positioned by the CT adjacent to the launch vehicle once the ML/Saturn V had been located on the pad surface. It was removed from the pad to the remote MSS park site by the CT during the closing hours of a countdown. Delivery of the Saturn V first and second stage flight hardware from Michoud or the MTF via barge dictated the need for a Barge Terminal. The terminal was connected from the original Saturn barge channel in the Banana River to the site of a turn basin adjacent to the VAB.



Launch Complex-39 Facilities

Launch Team Development Challenges (1963-1968)

The knowledge and experience that launch team members brought to Apollo from unmanned Cape Canaveral launch programs and manned Mercury and Gemini programs was invaluable to our eventual successes. The Apollo White sands Missile Range (WSMR) Abort and KSC Saturn I development flights introduced many of us to the world of launch vehicle and spacecraft ground operations. Early Apollo flight testing not only validated flight hardware designs but also helped establish a firm foundation from which we could expand our launch operations "know how" in the months and years ahead. As we processed and launched Apollo spacecraft, we learned more of the necessity for test discipline in our operational environment. We developed a better understanding of the need for valid test and operational requirements and of policies and procedures to guide our every day approach to planning and performing ground operations tasks. Lessons learned "drove home" the necessity of continued education and training in our individual disciplines and of "near perfection" in the development and implementation of test operations plans and procedures. We learned through experience that taking shortcuts while performing ground operations functions could invariably come back to haunt us, and that "Murphy" was always looking over our shoulder – "If it could happen, it would happen". With the Saturn IB and early Saturn V launches, we experienced both

success and failure. Over the years, however, through hard work and dedication and with great tenacity and desire we developed into a fine tuned, efficient launch team dedicated to a better understanding of the "unforgiving environment of space operations" while maintaining our 1969 lunar landing goal.

Program Management Development Plan

In early 1964 NASA released a document which very specifically discussed configuration oriented issues that were impacting both the Gemini and Apollo programs. NASA management dictated that these concerns be addressed immediately. Over the next few months, and in response to the challenge, configuration management and control panels were established at both NASA and at contractor facilities. Development and review of flight and ground system Interface Control Documents assumed a high priority on the program. Design checkpoint reviews still utilized today, PDR, CDR, FACI, COFW, DCRs and FRRs were established across the program. At KSC, an intensive Performance Evaluation and Review Technique (PERT) was introduced to provide flight and ground system design and development schedule visibility at three levels. Schedule tracking rooms were established at both NASA and contractor facilities. A support equipment records tracking system was introduced to maintain the status of thousands of pieces of ground system hardware located across the country. These improvements in the management process, although manpower intensive and costly, paid a big dividend and played a significant role in bringing order to the program from 1964 through 1966.

Organizing The Apollo CSM Work Effort (1964-1966)

With the flow of multiple complex spacecraft in our immediate future and with the need to activate spacecraft facilities rapidly approaching, we structured our organization to best meet our goals. As dictated by the design and development progress at each site; Dick Barton, the NAA Test Site Manager for the CSM, assigned site activation management responsibilities for LC-34 (Tony Pailleron), LC-37 (Don Butler), LC-39 Area (Charley Summerlin, Bill Bigelow) and for the KSC Industrial Area (Burt Yancey, Don Bower, Gene Bjerning). In September and October 1964, 1,270 members of the KSC Apollo and Gemini spacecraft launch teams (NASA and contractor personnel) were moved from Cape Canaveral to the MSOB on Merritt Island. Some members of the group had just successfully supported the launches of SA-6 and SA-7. A few team members continued to support the Saturn I Block II Pegasus launches on Cape Canaveral. Our manpower levels were still relatively low, but in late 1964 were on the rise. At the time of the move, three significant tasks were in work. A large number of the NAA employees were assigned to support site activation of the KSC Industrial Area and of LC-34, the future site of the initial Saturn IB launches. A second group was assigned to the development of operational planning and procedural documentation in support of Apollo Block I Spacecraft-009, -011 and -012 ground operations. A third major task placed emphasis on development and implementation of LC-39 site activation plans and procedures in anticipation of Saturn V 500-F Facility Verification Vehicle (FVV) activities. Engineering, shop and quality assurance personnel were identified to support specific facilities and the appropriate site managers. In support of the Saturn IB spacecraft planning effort, engineering supervisory personnel (Bruce Haight, Chuck Hannon and Chuck Stephens) selected senior subsystem personnel to take the lead to ensure readiness of our operational plans and procedures. In January 1965, NASA announced that the Titan Missile Site at LC-16 on the Cape would be converted to a Service Module (SM) SPS engine static test stand. Bob Winchester and Scotty Butler, a transfer from WSMR, were assigned responsibility to manage the activation of it. Site operational, sub-system engineering, shop and quality personnel worked feverishly from late 1964 through 1966 to ensure the readiness of their facilities to support flight hardware processing.

Saturn V Facility Verification Vehicle (FVV) 500-F

Since early 1963, design issues, hardware interface incompatibilities, funding problems and labor holdups caused schedule hiccups while much design and construction progress was made. By late 1964, many of the basic facility utilities had been installed and much of the structural and brick and mortar work had been completed. In the spring of 1965, with the basic construction of the VAB nearing completion, KSC conducted the traditional, facility steel workers "topping off" ceremony for the VAB. They also celebrated the formal opening of the KSC Headquarters Building. Prior to the end of the year, and with the VAB available for occupancy, upwards of 11,000 civil servant and contractor employees were relocated to Merritt Island. Some of them moved to the Industrial Area, a large number inhabited the VAB and an additional group moved to trailer complexes at the various facilities. To validate LC-39/Saturn V design interfaces, a plan developed in the early 1960s specified the use of a "dummy" Saturn V vehicle for that purpose. The vehicle was called the Facility Verification Vehicle (FVV) 500-F. The planned use of the FVV required the verification of many of the capabilities/features included within the design of the LC-39 facilities and ground equipment including stage stacking, mating, transport, service platform fit, propellant storage and loading at the pad – a wet test, and facility interfaces to associated ground support equipment that were specifically identified. To accomplish this, it was specified that each dummy stage would duplicate the flight configuration external interfaces (structural, fluid, ordnance, and umbilical connections) of the live counterpart. It also specified that the FVV would contain no live engines. An analysis of the operational schedules determined that the minimum list of facilities that would be required was the VAB High Bay 1, Firing Room 1, Mobile Launcher 1, a Crawler/Transporter, the MSS, and Launch Pad A. Throughout 1965 and into 1966, significant progress was made in "outfitting" and activating the critical sites. Each of the LC-39 facilities had their share of "outfitting" problems (i.e. cranes, swing arms, tail service masts etc.) Site activation problems were not unique to any one facility – numerous electrical and fluid system design changes impacted the work effort. To get the work accomplished on schedule; the construction, outfitting and flight vehicle contractors agreed to "joint occupancy" of facility areas, usually a "no-no". Occasionally, design workarounds to "outfitting" or activation problems were necessary and were instituted. When it was time to assemble the FVV, each contractor acknowledged that much outfitting and activation work still needed to be accomplished before the first live Saturn V stages arrived. By late March 1966, the

three "dummy" propulsive stages and the IU had been stacked and by early May the mating of the "dummy" spacecraft was completed. In late May 1966, 500-F rolled out from the VAB to Pad A. With the exception of an interruption by hurricane Alma, testing continued successfully until the FVV was returned to the VAB and de-stacked in mid-October. The utilization of the FVV played a key role in ensuring readiness of LC-39 for flight hardware. In mid-year 1966, while FVV testing was underway, there were three Saturn rockets sitting on different launch pads across the Cape – the Saturn V 500-F on -39A, AS-202 on LC-34, and AS-203 on LC-37B.

Saturn IB Unmanned Flight Test (1966)

The flights of the unmanned Saturn IB launch vehicle series were performed to qualify the Saturn IB launch vehicle and spacecraft systems (Launch Escape System, LES; Command Module, CM; Service Module, SM; Lunar Module, LM; and Spacecraft LM Adapter, SLA) for manned flight. Each mission built on the knowledge and experience gained from the previous flights. Design and development of the Saturn IB launch vehicle was based on a mix of existing designs from the Saturn I and Saturn V programs. The Chrysler-built Saturn IB utilized a redesigned, more powerful S-IB first stage, an S-IVB second stage built by Douglas, and an IU from the Saturn V program. The Saturn IB vehicle was designed to provide sufficient thrust to launch an Apollo spacecraft into earth orbit. This capability proved to be an invaluable asset for test/launch while the more powerful Saturn V vehicle and Merritt Island facilities were being designed and developed. The Saturn IB was 225 feet tall (including spacecraft and LES) and 22 feet in diameter. It utilized eight H-1 engines serviced with RP-1 fuel and liquid oxygen. The S-IVB second stage utilized one Rocketdyne J-2 engine fed by liquid oxygen and hydrogen. The IU provided the control commands for stage steering, engine ignition and cutoff, staging operations etc. Three unmanned test flights were scheduled for 1966. Two of the flights were scheduled to check out the Saturn IB integrated CSM/LV configuration, while the third flight tested the liquid hydrogen propellant system of the S-IVB stage. A fourth Saturn IB launch scheduled for the end of 1966 was intended to carry the first Apollo flight crew into space. Riding on the first Saturn IB Mission (AS-201) was CSM-009, the first Block I flight production model of the Apollo spacecraft. From late 1963 until mid-1965 LC-34 underwent major modifications. The old service structure was almost completely rebuilt. New silo enclosures and service platforms and swing arms were incorporated. Major changes to the propellant loading facilities were made.

Saturn IB AS-201 – The increased complexity of the unmanned Saturn IB missions compared to that of the Saturn I was mind boggling. More employees arrived from Downey, WSMR, Columbus, Tulsa, the Mercury program, and from existing launch vehicle programs on both the East and West Coast and from local colleges. CSM-009 consisted of a Block I unmanned configuration of the LES, CM, SM with a BP configuration of the SLA. The Service Propulsion System (SPS), CM and SM Reaction Control Systems (RCS), aft crew compartment and forward heat shield assemblies and the spacecraft/LEM adapter structure were being flown for the first time on AS-201. Batteries were installed in lieu of fuel cells, the Emergency Detection System (EDS) was flown open loop and a control programmer (canned man) was flown to initiate many of the normal crew or computer initiated functions. Partial segments of the Environmental Control System (ECS), and Communication and Instrumentation systems were also flown. The S-IB first stage arrived from the Michoud Assembly Facility via barge in mid-August 1965 and was erected on LC-34 shortly afterwards. The S-IB was the first Saturn stage to enter the Banana River and KSC through the Canaveral locks. The S-IVB second stage and the IBM IU arrived by air in October and by the end of the month all stages were stacked on LC-34 and were undergoing test in preparation for the receipt of the spacecraft. In mid-October 1965, NASA accepted CSM-009 and shortly afterwards each of the major elements were delivered to KSC from Downey (CM, SM, and LES) and from Tulsa (SLA). Upon delivery to the MSOB, each module underwent a receiving inspection and was transported (except the SLA) to the appropriate remote facility. The SLA remained in the MSOB for modification work. Each of the individual facilities proved their readiness for spacecraft use. Leak and functional tests (utilizing the ACE capability) was completed on the CM RCS and the SM Quads at the HMF. At LC-16 SPS leak and functional tests, propellant loading and static firing of the SPS engine was completed. At the Pyrotechnics Insallation Building (PIB), LES and ELS buildup and ordnance installation was completed as was LES thrust vector alignment and CM weight and balance. Upon completion of the remote facility activities, each module of the vehicle was returned to the MSOB. The CM and SM were then mated, subsystem and integrated test operations utilizing ACE were completed, and the CSM was mated to the SLA. On CSM-009 there was no altitude chamber testing. Upon completion of CSM/SLA mating operations, SLA ordnance was installed and the spacecraft was carried on a vertical transporter to LC-34. The CSM/SLA was mated to the S-IB (AS-201) launch vehicle in late December 1965. During the weeks leading to launch, pad operations continued to follow the standardized flow from launch vehicle mate operations through launch. On February 26, 1966 the Saturn IB carried the Apollo Block I spacecraft CSM-009 from Cape Canaveral on a 37-minute suborbital mission. The spacecraft was recovered in the Atlantic Ocean by the *U.S.S. Boxer* two and one half hours after splashdown. Both the launch vehicle and the spacecraft performed quite well. All of the primary objectives were met. Of significance was that the spacecraft/launch vehicle compatibility was verified, all stage and sub-system mechanical and explosive separations were accomplished per plan, performance of the CM aft heat shield under high stress conditions exceeded expectations and the performance of the Emergency Detection System (EDS) was confirmed.

Saturn IB AS-203 – Although planned as the third in a series of tests of the Saturn IB launch vehicle, a delay in the delivery of CSM-011 for the AS-202 flight caused NASA to decide to process the Saturn IB (AS-203) vehicle first. The purpose of the AS-203 mission was to test the dynamics of liquid hydrogen in the weightlessness of space. There was no requirement to fly a spacecraft. In its place an aerodynamic nosecone was used. Design engineers were concerned as to how liquid hydrogen would react in the S-IVB hydrogen tank when, on a Saturn V mission it's engine was fired to accelerate the vehicle to the moon. AS-203 was launched successfully on July 5, 1966. During the mission, it was determined that the hydrogen fuel

reacted as predicted and that the S-IVB J-2 engine could be restarted in flight with no problems expected.

Saturn IB AS-202 – The Saturn IB utilized on the AS-202 mission was of the same configuration as that which powered both of the two previous Saturn IB flights. CSM-011 was a Block I configured vehicle but of much greater complexity than CSM-009. The more significant Block I configuration differences between the two spacecraft included the addition of guidance and navigation (G&N) and fuel cell/reactant subsystems, electrical power and environmental control sub-system radiators, a modified Mission Control Programmer (MCP), a closed loop EDS, S-band communications equipment and three auxiliary power batteries. The mission was again flown in an unmanned configuration which led to deletion of the flight crew couches and stowage items. The checkout and assembly flow of the hardware through the Industrial Area was very similar to that which had been performed on CSM-009 but lasted slightly longer. The increased flow time was due primarily to first time testing of new systems and to the addition of altitude chamber testing in the KSC flow. The SPS static fire on LC-16 and the ELS buildup in the PIB were eliminated from the flow. The mission was initiated from LC-34 in late August 1966. The sub-orbital flight lasted for 1 hour and 30 minutes during which time the MCP initiated four successful SPS engine burns. The spacecraft landed in the Pacific Ocean near Wake Island and was retrieved by the aircraft carrier *U.S.S. Hornet* recovery forces 10 hours after liftoff. On the carrier, specialists found that the heat shield and the capsule had admirably survived the reentry. The AS-202 test flight demonstrated the structural integrity and compatibility of the stages and of the spacecraft during powered flight, coast and reentry. All major sub-systems performed within design limits and close to the values predicted.

Saturn IB Manned Ground Test Explosion – (1967)

In 1966, we had three successful Saturn IB unmanned launches from LC-37B and were preparing for the first manned Saturn IB Apollo launch. While our launch team was processing CSM-011 at KSC in support of the third Saturn IB unmanned launch, other members of our launch team were supporting Downey ATO in the checkout of CSM-012. Our initial goal was to launch the AS-204 mission in 1966. The mission was to have been the first manned Apollo spacecraft venture into space. The NASA flight crew selected for the mission was comprised of Gus Grissom (Mission Commander), Ed White (CM pilot) and Roger Chaffee (LM pilot). Fittingly enough, in June 1966, Grissom and his crew had received permission to refer to their spacecraft as Apollo 1 and to develop a patch that so indicated. Although there was a large amount of open work on the vehicle, agreement was reached at the Customer Acceptance Readiness Review to "ship short" and to complete the open work items at KSC. The CM, SM, SLA and LES were all received at KSC by late August.

Saturn IB AS-204 CSM-011 Checkout Operations – The Block I vehicle configuration was very similar to that of CSM-011 but was supplemented with crew couches and flight crew stowage items. As the vehicle was being processed through the Industrial Area facilities, the combination of open work items and hardware failures caught up with us. Upon the completion of CSM mating operations and integrated testing in early October, altitude chamber tests were initiated. They were terminated late in the month due to technical problems found during a chamber run. ECU design problems and SM SPS corrosion concerns (which dictated a CM/SM demate) weren't totally resolved until early December. As a consequence of our problems, the AS-204 launch date was moved to February 1967. During the test and checkout "down time", open transferred work items and new design changes consumed much of the time of the work force. Upon completion of most of the open work items and resolution of the technical problems it appeared that everything was coming together. The CM and SM were again mated and installed in the altitude chamber. In late December, we successfully completed sea level and unmanned and manned altitude chamber runs. In early January, we mated the CSM to the SLA, installed the SLA ordnance and moved to LC-34 to hard mate with the Saturn IB. Throughout January, spacecraft operations at LC-34 went quite well. On the morning of January 27, 1967 we believed that both the spacecraft and the launch team were ready to support the integrated stack "plugs out" test. During the entire 1st shift, while we conducted the integrated test, we continuously encountered communication problems between the ACE Control Room, the flight crew in CSM-012 and the astronaut capsule communicator in the LC-34 blockhouse. We never did reach the point in the test sequence when we would disconnect all electrical interfaces (plugs) between ground and flight hardware and operate the spacecraft on internal power. At 6:31 P.M. a report of a fire in the CM was heard over the communication loop. Beyond that point, it's all history. Shortly afterwards, we learned that we had lost all three astronauts.

Apollo 1 AS-204 Tragedy/Investigation/Changes – On the day following the fire, January 27, 1967, an Apollo 204 Review Board led by Floyd Thompson, Director of the Langley Research Center, was established to investigate the accident that took the lives of the Apollo 1 flight crew. Shortly afterwards, a memorial service for the three astronauts was held in Houston. Two days later, funeral services were held for Gus Grissom and Roger Chaffee at the Arlington Memorial cemetery in Washington, D.C. and for Ed White at West Point. Once the situation at the Cape had stabilized, the Apollo 204 Review Board Chairman established 21 Task Panels to support the Review Board in its investigation. The activities of the individual panels, which involved a few members of the test team, continued for the next month. CSM-012 was moved from LC-34 to the PIB facility where the damage was assessed in greater detail than was possible on the launch pad. CSM-014 was sent from Downey to KSC and was also placed in the PIB and used for configuration comparative purposes with CSM-012. With no possibility of maintaining the existing Apollo program schedules, they were cancelled to prevent avoidable slips and cost overruns. Early in this timeframe, NASA Headquarters sent a memo to each of the NASA Centers directing that checkout and launch preparations of AS-501 proceed as planned except that the CM would not be pressurized in an oxygen environment pending further direction. A Congressional probe intended to uncover the cause of the Apollo fire was initiated in Washington, D.C. and, for a short period of time, moved to the KSC O&C Building where many of us were called upon to testify. In the midst of the investigation, NAA merged with Rockwell Standard Corporation and became North American Rockwell (NAR). On April 5, 1967,



NASA Photo

Seated at the witness table before the Senate Committee on Aeronautical and Space Services on the Apollo 1 accident are (left to right): Dr. Robert C. Seamans, NASA Deputy Administrator; James E. Webb, NASA Administrator; Dr. George E. Mueller, Associate Administrator for Manned Space Flight, and Maj. Gen. Samuel C. Phillips, Apollo Program Director.

the Apollo 204 Review Board completed and submitted its final report to NASA Administrator James E. Webb. It summarized its findings as to the cause of the fire as follows: "The fire in Apollo's floor was most probably brought about by some minor malfunction or failure of equipment or wire insulation. This failure, which most likely will never be positively identified, initiated a sequence of events that culminated in the conflagration". The Board identified the conditions that they believe led to the disaster and that should be addressed. Those conditions specifically identified were a sealed cabin pressurized with an oxygen atmosphere, an extensive distribution of combustible materials in the cabin, vulnerable wiring carrying spacecraft power, vulnerable plumbing carrying a combustible and corrosive coolant, inadequate provisions for the crew to escape and inadequate provisions for rescue or medical assistance.

The report went on to identify related factors as having contributed to the incident that should be addressed prior to the resumption of Apollo flight testing. Identified were programmatic technical integration, safety/emergency procedures, hardware configuration management, materials control internal to the spacecraft, hatch design and flammability test programs. Having specified the conditions that led to the disaster, a concern of the Board was how these conditions came to exist. The conclusion drawn was that "in its devotion to the many difficult problems associated with space travel, the Apollo team failed to give adequate attention to certain mundane but equally vital questions of crew safety".

One astronaut assured NASA's top officials that he would not have been afraid to enter the spacecraft on that January day. During his testimony, Frank Borman reiterated that the cause of the fire was lack of oversight, rather than negligence or overconfidence as was being suggested. He pointed out that fire in flight had been a matter of grave concern over the years. The thought that a fire hazard on the ground may be increased by the addition of flammable materials and overpressure of pure oxygen in the spacecraft had never been seriously considered. In summary, the Board's investigation revealed numerous deficiencies in design, engineering, manufacture and quality control. In the months following the incident, the program addressed each of the conditions and significant concerns that led to the disaster and initiated corrective action to resolve each of them Subsequent to the release of the Review Board Report, major facets of the program were also considered and numerous actions were taken.

An Apollo system safety program was established by NASA Headquarters. A NASA task team to support a Block II CSM redefinition was established in residence at NAR. The purpose of the team was to provide timely decisions during the spacecraft redefinition phase following the fire. Management changes deemed necessary were initiated both within the NASA and the contractor organizations. George Low replaced Joe Shea as NASA Apollo Spacecraft Program Manager in Houston. Bill Bergen, previously with the Martin Company, assumed the role of the new President of NAR Space Division replacing Harrison Storms and Buzz Hello took over as the NAR Vice-President of Apollo Launch Operations at KSC. From Martin, came G.T. Wiley as an advisor to Buzz Hello and John P. Healey to manage the first Block II spacecraft activities from manufacture through launch.

Apollo Program Director Samuel C. Phillips appointed a team to conduct a special audit of quality control and inspection procedures of NASA contractors and of NASA itself. A program wide documentation plan was established to ensure an adequacy/consistency of requirements between NASA centers and their contractors. As the days and weeks rolled by and as the actions to resolve the deficiencies identified were being completed, management sensed that a recovery from the tragedy was occurring and that a demoralized workforce was rapidly gaining strength and confidence for the stretch drive. After reviewing the progress made since the fire, it was decided that the Apollo space program was ready to return to flight. An unmanned launch of AS-501, carrying Block I CSM-017 was set for October 1967. If the flight was successful the plan was to move ahead as rapidly as possible toward a manned flight. By the end of summer 1967, most of the specific corrective actions that satisfied the concerns of the Board had been implemented and the processing of the AS-501 vehicle moved cautiously ahead.

While fallout from the investigation was still being absorbed and implemented, NAR management announced that T.J. O'Malley, formerly the Mercury Test Conductor with General Dynamics at the time of John Glenn's Mercury launch, had accepted the position of NAR Director of Apollo Spacecraft Operations at KSC. Based on his knowledge and experience, Tom, reputed to be a disciplinarian, restructured the CSM organization to more clearly identify the authority, responsibilities and accountability of each individual and group. Generally speaking, he expected the engineers to provide the technical direction on the CSM program at KSC, the technician/shop workforce to implement that direction and the quality organization to be the "check and balance" to ensure its proper accomplishment. While supporting the investigation and the changes driven by it; the site activation effort at each of the Saturn V LC-39 facilities and the processing of AS-501 became

the top priority. As a consequence of the investigation, numerous changes to the KSC documentation system were made. In addition to supporting the investigation and the changes driven by it. The activation effort of each of the Saturn V LC-39 facilities and the processing of AS-501 became the top priority. As a consequence, upgraded NAR Launch Site and NASA administrative policies and procedures, with heavy emphasis on safety and quality, were released to more effectively control the day-to-day operations. New guidelines were established per Apollo Program Directive #26 to document and control the preparation and approval cycle of test requirements and operational plans and procedures. Changes were instituted in the KSC documentation system that dictated the need for greater design center involvement. A new incident investigation and reporting criteria was established on the program to ensure that appropriate management evaluation was made of any incident that led to hardware damage or personnel injury or death.

In the summer of 1967, key personnel at the Manned Spacecraft Center in Houston began to evaluate how best to get Apollo to the moon before 1970. There was little more than two years left in which we could meet this goal. Discussion revolved around a series of seven mission types (eight flights) that would be the precursor to a manned lunar landing. Of these eight flights, two of the missions would fly on the Saturn IB, five would fly on the Saturn V and the eighth could possibly go on either vehicle. Although no final decision was made at that time, the plan was generally adopted throughout the NASA. Following on the heels of the AS-501 launch was the possibility of a manned Saturn IB launch.

To Be Continued

About the author: During his 34 years with NAA/Rockwell, Bill served on the Apollo, Space Shuttle and Space Station programs in a supervisory or management position. Half of that time was dedicated to launch operations on Apollo and Space Shuttle at KSC. Since his retirement in 1996, he has served as an aerospace consultant. Bill currently resides in Newbury Park, California with his wife of 53 years, Penny.

Autonetics Memorial Photos by Ralph Guyman



Don Ornellas, Larry Wilson, Mona Ceballos, and Leila Guymon



Larry Wilson, Pat Kubera, and Al Kubera



Terry Waki, Virginia Pace, and Marine Systems VP Hugh Galt



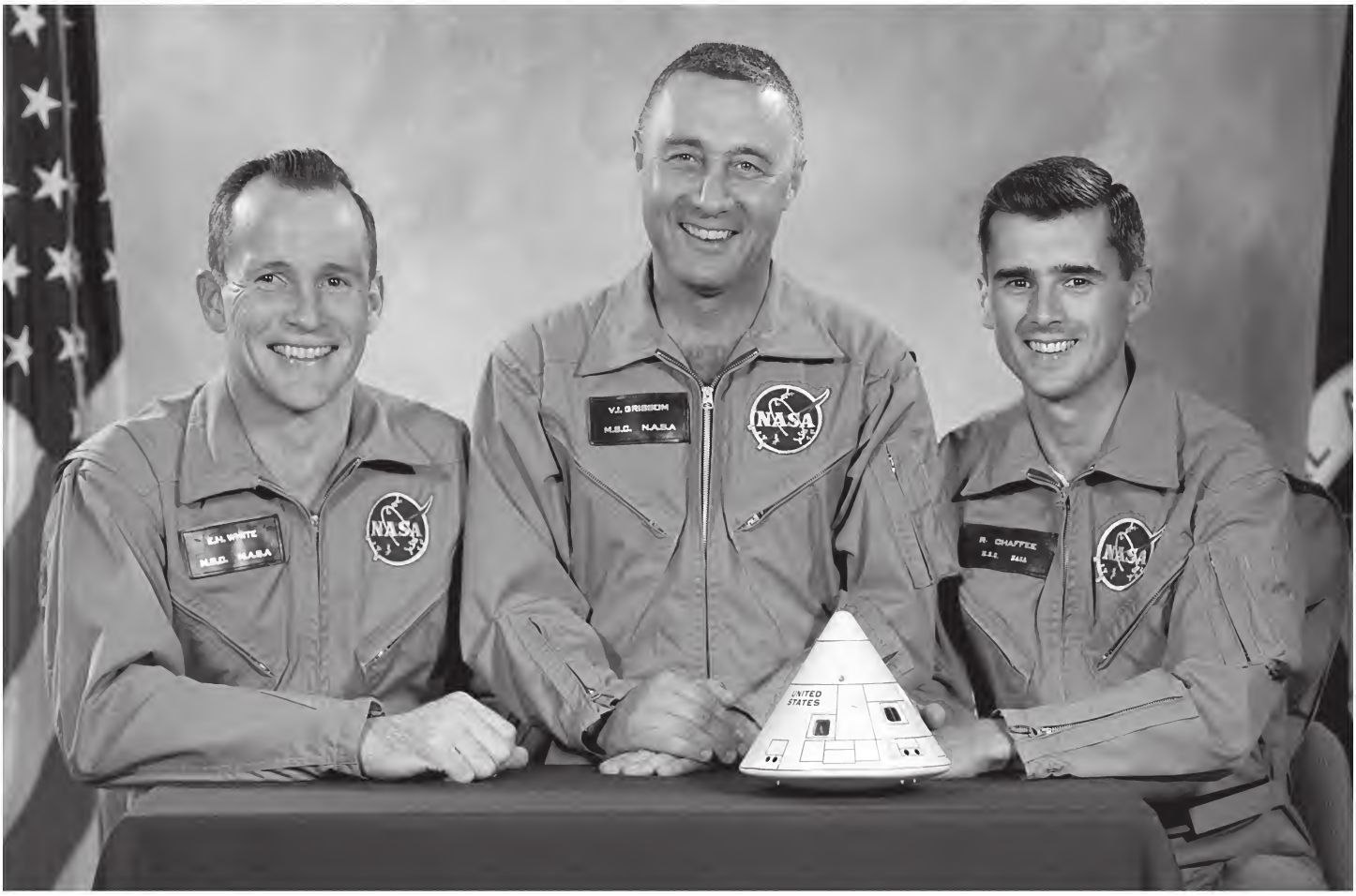
Fleet Systems Engineering Manager Ralph Guymon



Dr. Tom DeVries and Dr. Stan White

The Apollo 1 Fire Investigation

by Larry Korb



NASA Photo

Portrait of the Apollo 1 prime crew for first manned Apollo space flight. From left to right are: Edward H. White II, Virgil I. "Gus" Grissom, and Roger B. Chaffee.

We couldn't believe the report! We were horrified! We were devastated! How could we have a fire in the Apollo Command Module during a test on the pad that killed three astronauts? Gus Grissom, Roger Chaffee, and Ed White died in that fire! Sure, we knew the moon mission was a risk! We worried about explosions during the launch. We were fearful of burning up during reentry. We were concerned about crashing into the moon, or leaving them on the moon for eternity. If the SPS engine, God forbid, did not fire for the full 247 seconds on lunar approach, they would spend eternity in a solar orbit. But to lose astronauts on the pad during a routine test seemed so remote that it never entered our minds. Perhaps, that was part of the problem, for maybe the test engineers were too complacent about precautions in that 100% oxygen environment. The roots of this problem lie in the early history of the Apollo program, so I'd like to go back to the beginning and put this in proper perspective.

The Manned Space Age

If you are 56 years old or older, you must remember the elation throughout the country that occurred on May 5, 1961 when Astronaut Alan Shepard was lofted 116 miles into space in the Mercury spacecraft *Freedom 7*. The flight was 15 minutes and 22 seconds long, achieved a velocity of 5,180 mph and the spacecraft was recovered some 303 miles down range. This was particularly heartening because 23 days earlier, the Russians had put Cosmonaut Yuri Gagarin into a single orbit around the Earth in Vostok 1. Most Americans had the impression that we had nearly caught up with the Russians in manned space. But it was truly an illusion. You see, Alan Shepard was launched by a Redstone Rocket, a short-range modified V-2 rocket, used by the Army in Europe. It had an operational range from 57.5 mi. to 201 mi., and was capable of carrying the 6,300 lb payload of a 3.5-megaton nuclear warhead. It weighed 61,207 lb and produced 78,000 lb of thrust for 121 seconds. The Mercury spacecraft weighed 2,986 lb and, hence, was able to achieve the extended range of over 300 miles.

Vostok 1 was launched with a 3-stage booster system with thrusts of 873,000 lb, 205,000 lb, and 12,250 lb. Vostok 1, a 10,480 lb spacecraft, achieved an elliptical orbit between 105 and 203 mi. Because the Vostok was 3.5 times as heavy as the Mercury and achieved a speed of 17,500 mph, it had 40+ times the energy of *Freedom 7*. No astronaut could be launched into orbit until the Atlas D (ICBM) became available.

Nevertheless, President John F. Kennedy, prodded by Wernher von Braun, addressed Congress on May 25, 1961 with his vision

to put men on the moon and return them safely to Earth before the end of the decade. And so Congress and the American people embraced the race to the moon against the Russians. Never mind the fact that it took us 14 consecutive unmanned failures before we got close-up pictures of the lunar surface. Our first successful probe occurred on July 8, 1964 (over 3 years later). The Russian spacecraft, Luna 3, circled the moon on October 4, 1959, some 4 years and 9 months earlier. The Apollo Program was filled with political pressures to catch up and surpass the Russians.

On July 28, 1961, the Apollo contract was sent out for bid. Nine months earlier, Convair, GE, and Martin had won study contracts on the Apollo. The North American Aviation (NAA) Space Division's new president, Harrison "Stormy" Storms, decided to bid on the Apollo. The Division had just completed its bid on the Saturn S-II contract and was waiting with bated breath to find out whether we won it; otherwise, the Space Division would be shut down. Stormy was not about to let engineers sit idle while waiting for the Saturn S-II, so he put us to work on the Apollo bid. While the Saturn proposal totaled over 3,300 pages, fortunately, the Apollo technical section was limited to 150 pages (so we couldn't show our full depth of ignorance). On September 11, 1961 we won the Saturn S-II contract and logic told us there was no way we could also win the Apollo contract. After all, NAA had all the booster engines for the Saturn stack and the Saturn S-II. If we won it we would have, perhaps, 85-90% of the NASA space program.

Dr. Francis Hung, our Director of Dynamics, went back to the Orals with Stormy and came back saying we would win the Apollo. I bet him a cup of coffee that he was wrong. He said Stormy wowed them with his answers. When asked, "What is the most important challenge of the Apollo Program," Stormy said, "Gentlemen, technical management is your major challenge. That is why I selected John Paup as Program Manager." (Paup has a nation-wide reputation with the Air Force as a top Program Manager.) Then Stormy introduced Charlie Feltz as his Chief Engineer. He said, "Charlie was Chief Engineer on the X-15 Program. We never missed a schedule, a performance goal, and never overran costs." He said, "That is no accident! That is just damned good management." He then proceeded to tell how some of the teams are consortiums; joint efforts by a heat shield subcontractor, a structural subcontractor, an avionics subcontractor, and a propulsion subcontractor. Stormy said, "If you have a problem, there is going to be finger-pointing." He explained, "We are not in bed with anyone. We are free to select the best heat shield, propulsion, and avionic companies to support the structure we will design. If something goes wrong, there is a single ass to kick!" (or words to that effect).

It had been announced on November 27th, that the Martin Company had won the contract with a bid evaluation score of 6.9, versus 6.6 for NAA and GD, and 6.4 for GE and McDonnell. The next day, Stormy and Scott Crossfield met President Kennedy, and Kennedy awarded the Harmon Trophy to Scott for his flights on the X-15. Bob Seamans, Deputy to the NASA Administrator was at that meeting and told Stormy that afternoon, after the meeting, that we had won the Apollo! It was also stated that day that the bid was overturned at the highest level of the U.S. Government. NAA was selected on the basis of "experience, technical competence, and cost". We won the award on November 28, 1961.

The Use of Oxygen for Spacecraft Atmosphere

In the NAA original bid, a two-gas system was proposed-a combination of nitrogen and oxygen-just like we breathe on earth. NASA had strong objections because it required two tanks, separate regulators and some sort of sensing device to maintain the right mixture so astronauts would not pass out. We, led by Dr. Toby Freeman, argued vehemently against NASA's Max Faget. NASA told us the decision was final: pure oxygen. Charlie Frick, NASA Apollo Program Spacecraft Officer, told NAA, "You are the Contractor. You'll do as you're damned told, period". Stormy told Robert Gilruth, head of the Space Task Group, he would not use pure oxygen without a written order. Contract Change Notice #1 was issued by NASA for a cabin of 100% pure oxygen at 5 psi pressure.

The Command Module (CM) consisted of two concentric honeycomb sandwich structures. The inner structure used a welded aluminum pressure vessel as an inner face sheet, to which honeycomb and outer aluminum face sheets were adhesively bonded. The outer shell was a brazed stainless steel honeycomb to which an open-cell fiberglass honeycomb was bonded and filled with heat-resisting ablative. There was a hatch for each shell. The inner hatch sealed the pressure within and the outer hatch kept the reentry heat out.

NAA proposed an explosively operated escape hatch which would allow a fast emergency exit. On July 10, 1962, Max Faget and a contingency of NASA engineers and astronauts arrived at Downey to discuss the hatch. NAA argued that hundred of explosively actuated escape systems were used by pilots, without a mishap, saving their lives. Max Faget opposed it, fearful that it could open on the way to the moon. Gus Grissom, who almost drowned in his Mercury spacecraft, opposed it because he said the McDonnell explosive hatch "just blew" as it hit the water. Again, NASA directed NAA, in writing, to have an inward opening, simple hatch without an explosive charge to allow for an emergency exit. It was to be a plug-type square hatch sealed by internal pressure. The exit time through this two-hatch system was 90 seconds. Ironically enough, both of these decisions sealed Gus Grissom's fate on January 27, 1967. These, of course, were not the only design features or test requirements which caused the Apollo oxygen-fire disaster. But the seeds were sown 4-1/2 years before the fire.

NAA wanted a fire suppression system installed, i.e., flooding the spacecraft with nitrogen. One of the counter arguments was that they could depressurize the cabin and get rid of the oxygen into empty space during a fire. Another request from NAA, I was told, was to study "the technology of an oxygen fire". We were turned down.

Another important design weakness was the joining method for aluminum tubes-soldered joints. Aluminum tubes were used to join the aluminum heat exchanger, aluminum coldplates, and various other connections to the Environmental Control Unit (ECU). We found that aluminum tubes with 0.020" walls could not be properly welded; often the molten bead would block the inside fluid passage. B-nuts, which depended on flaring tube ends, were very heavy and had a high leakage rate; however, a few were used to aid in equipment removal. Aluminum could not be brazed because of the highly corrosive fluxes needed to destroy its tenacious oxide film. So we soldered the joints. The ends of the tubes were plated with tin. Tin-lead resin-core solder, placed in grooves in the union was heated (by induction)

to finish the joining process. The solder was sufficiently strong at the maximum internal surface temperature permitted in the Command Module, 190°F, but much above 200°F, the joints would creep under load, such as by tightening a nearby B-nut. Though technically within specification, these joints could not survive an oxygen fire. Soldered tubes carried flammable ethylene glycol and both 100 psi and 900 psi oxygen.

The Program Was Slow to Mature

In the early 1960s, NASA programs were in a state of flux. On December 22, 1961, a month after the Apollo 3-man spacecraft award, McDonnell was awarded a go-ahead to define a two-man spacecraft, a redesigned Mercury, called "Gemini". This was 2 months before the first manned orbit by the Mercury (John Glenn-3 orbits on February 22, 1961). With three different spacecraft programs underway, there was still no manned Spacecraft Center in Houston until September 1963 to house NASA's manned spacecraft personnel. NASA realized that they needed the Gemini to demonstrate that men could survive two weeks in space, that they could rendezvous and dock in space, and to prove the lifting body reentry concept (versus the ballistic missile concept of the Mercury).

Concurrent with this, NASA had still not settled on a trajectory concept, which was crucial in defining the size of the booster. If they used a "direct ascent" with the Apollo being launched to the moon, landing on the moon, and returning to the Earth, a booster of 12,000,000 lb of thrust (Nova) would be required! A second concept was called "Earth Orbit Rendezvous" in which rockets were orbited and assembled in orbit for a lunar shot. A third concept, "Lunar Orbit Rendezvous" favored a Lunar Module (LM), which would mate with the Apollo CSM, depart for the moon and return to the Apollo Command Module, then be left in the lunar vicinity. It turned out this concept was much lighter and would permit a first stage of the Saturn V rocket to have 7,500,000 lb of thrust. On September 12, 1962, Grumman was chosen to design and build the Lunar Module. So 10 months after the Apollo contract award we had sufficient definition to build the Command Module, Service Module and LM Adapter (to house the LM). The Apollo designs that were underway and being built were called "Block I" Command Modules versus a redesigned version with a removable docking probe, called "Block II" Command Modules.

Early Design and Manufacturing Activities

The early days of the Apollo Program were chaotic. We were bringing in 1,000 people per month for two years to work on the program. Our Quality Control took 1-1/2 years to certify welding machines because they demanded greater strength than the welds needed and far above our design allowables. Bob Olsen, my boss, presented to the Chief Engineer, Charlie Feltz, an M&P Charter explaining in detail the areas in which we would assume responsibility, to include materials and processes and their testing, specifications, design allowables, failure analyses, drawing reviews and approvals, and responsibility for specific hardware, such as pressure vessels, honeycomb sandwiches, fasteners, cold plates, plumbing, and for technologies such as corrosion control, metallurgy, etc. For example, when honeycomb sandwich panels made by Manufacturing became "debonded", Olsen was in charge of a tiger team to find out what went wrong and correct it. He acquired the name "Sticky Olsen" for his efforts and the name "Sticky" stuck throughout his career. As M&P, we had a great responsibility for the kinds of plastic materials which were chosen for use in the cabin design.



NASA Photo

High angle view of the Block I Apollo Command Module 012 during pre-shipping operations in south air lock of Systems Integration and Checkout Facility.

In 1965, General Samuel C. Phillips, Apollo Program Director, sent a "Tiger Team" to find out why we were missing costs and schedules and wrote a very damning report to Lee Atwood, NAA's Chairman of the Board. (General Phillips' job was to terrorize contractors to make them respond.) He was not the least bit interested in the progress of the hardware, but rather focused on the paperwork supporting the schedules and costs. The added pressure was very difficult to sustain. We had a program called PERT on the mainframe computer to track 30,000 critical parts. Every two weeks, it would spit out 40 boxes of printouts, but nobody had the time to look at them. Further, as the program matured, over a thousand changes were made each year by NASA and by our own engineers, impacting manufacturing schedules. Every time we got way behind, we had put out a new Master Development Schedule. Based on Phillips' strong input, we decided that Master Development Schedule #9 was the last one we would issue. On a return visit in 6 months, General Phillips claimed we made very good progress (of course, we then had Master Development Schedule 9, Rev. 1, Rev 2, …). What was interesting in the post-fire meeting with Congress, neither General Phillips' boss, George Mueller, nor had the Chief NASA Administrator, James Webb, heard of the General Phillips report on NAA. They assured Congress that he never wrote a complimentary report on any contractor.

Command Module 12 (Block I) was to be used for the first manned flight planned for February 21, 1967, and was sent to the Cape on August 26, 1966. It finally appeared we were on schedule with our major engineering problems well behind us. We were elated.

"Fire in the Spacecraft"

A high level meeting was held in early January 1967 to discuss the many last-minute Apollo changes and to request additional time to incorporate the 653 engineering orders after CM 12 delivery. Although both NAA and NASA Houston concurred that a delay was needed to finalize testing readiness, NASA Washington refused to grant schedule relief.

The spacecraft successfully completed altitude tests. Next, a "plugs-out" test was to be performed. The spacecraft was shifted to internal power and disconnected from external power sources. The purpose of this test was to insure the integrity of the on-board power. The test was run with 100% oxygen at 16.7 psi. Wally Schirra suggested that Dr. Joe Shea, NASA's Apollo Program Manager, get inside of the Command Module with the crew, sitting on the floor next to Gus's couch and go through the countdown to gain some perspective of what it was like. Shea agreed and asked the test crew to install an additional communication line for him. The test crews reported the next morning that this would require leaving the hatches open, compromising the test. (Ironically, the last test of the "plugs out" test sequence was an "emergency egress" from the Command Module.)

The crew entered the cabin in their space suits with their environmental control system oxygen loop at 1 P.M. EST. They spent time in "holds" trying to check out a "sour buttermilk" smell in the suit loops (later determined not to be fire related), and had communication difficulties. By 6:20 P.M. EST, all countdown functions up to the transfer to simulated fuel cell power were completed and they began a 10-minute hold to trouble shoot routine communications problems. During this period, the following occurred:

6:30:39.4 – significant movement of an astronaut (Gissom).
6:30:54.8 – significant voltage surge in #2 bus.
6:31:04.7 – first verbal indication of a fire in the Command Module.

Under these circumstances, the senior pilot, White, is to initiate emergency egress procedures involving the inner hatch and considerable activity was picked up by sensors.

The astronauts sustained second and third degree burns, but were overcome by the toxic gases. Very soon after the reports of the fire, some technicians left to get fire extinguishers and masks. The hatches were so hot that technicians could not get them opened for about 5 minutes. The astronauts were probably unconscious at that time from a lack of oxygen to the brain and heart. (When they died is uncertain.) It took 7 hours to extricate their bodies. The astronauts were literally glued to the seats, the floor, and each other due to the melted nylon and its subsequent solidification. Had they been rescued within 5 minutes after the fire, they may have survived. Ironically, the treatment would be to put them into an oxygen mask.

After the astronauts were removed, a critical step was to have another astronaut verify the position of all of the switches. To do so, from a safety standpoint at this time, required removal of the Launch Escape Tower and disabling existing pyrotechnics in the Command/Service Module (CSM) system. Soon after this, fire experts could be sent into the Command Module to try to locate the fire origin and the direction it burned.

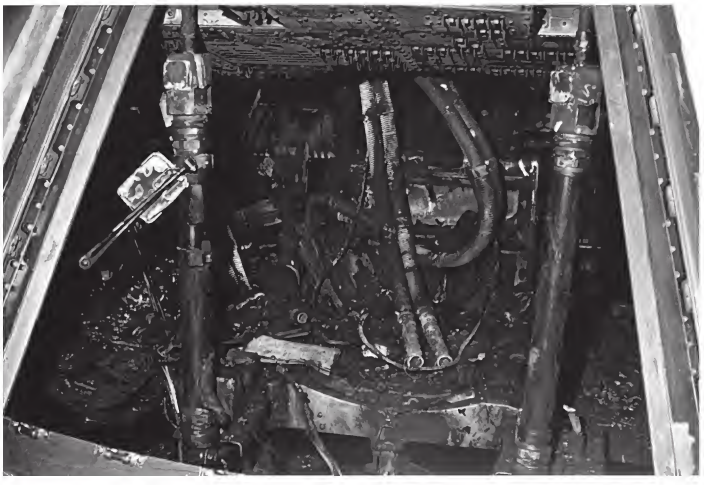
The Apollo 204 Review Board

Shortly after the fire occurred, NASA and NAA formed 17 four-man teams, consisting of a representative from NAA, MSC, MSFC, and NAA KSC to investigate various specific subjects related to the fire. While the fire started at 3:31:04 P.M. Pacific Standard Time on Friday, those of us assigned to a team flew into Melbourne, Florida, on Saturday morning. I was assigned as Chairman of "Team 10, Analysis of the Fracture Areas". On Sunday, Bud Benner, NAA Assistant Chief Engineer, held a caucus at the Holiday Inn and we all shared our information, tasks, and approaches.

Floyd Thompson of NASA (Director of NASA Langley) was in charge of the "Apollo 204 Review Board". Our teams turned into "Panels" and the number of Panels rose to 21 and a few additional people were added. Dr. Thompson assigned a board member to each Panel who would sign off on Panel requests. He issued a new Administrative Procedure nearly every day for three weeks, providing details on how to get everything done, such as test requests. By February 1, each Panel had to define the scope of their tasks, the tests that they wanted to run, estimated a cost for each task, and provide the schedules that they would meet, including reports. Panel Chairmen were reshuffled until the Chairmen only came from NASA MSC (Houston) and KSC. There were no Panel Chairmen from MSFC (Huntsville) or from NAA. Eventually, the Apollo 204 Review Board recognized that system engineers would be required to check out each piece of equipment and outside experts were also called in. Finally some 1,500 people were directly involved in the investigation. However, the final report of each Panel constituted the backbone for the Final Apollo 204 Review Board Report, which some sources say exceeded 3,300 pages. It is now available on the internet!

Origin and Propagation of the Fire

Panel 5 determined the fire went in 3 stages. The initiation stage occurred at 6:31:04.7 on the left side of the Command Module near or under the ECU, not far from Grissom's feet. The fire continued until 6:31:19.4 when the Command Module blew apart by internal gas pressure. The next 5 seconds resulted in the gases and flames rushing out of the Command Module through the crack on the lower right side where the sidewall joins the floor. This was followed by the final stage in which the fire decayed and carbon monoxide, smoke and soot were produced.



NASA Photo

This view of the interior of CM-012 shows the effects of the intense heat of the flash fire.

My Investigation

The Apollo was at Pad 34 on top of an unfueled Saturn IB and Saturn S-IV rocket. To get to the Command Module-012, one had to ride the elevator in the umbilical tower to a platform some 200 feet in the air, walk the 30-40 ft length of a 3-ft wide gangplank to enter an enclosed room with a floor surrounding the Command Module. The gangplank was open to stiff breezes and each side had guide rail posts, consisting of tubes connected with loose chains, dangling like catenaries, to join them. I was petrified when walking on this gangplank. It was like walking on a board across the street between the 20th floors of two skyscrapers. Once inside, however, I felt I was in a safe room.

On my initial visit, I put my head in the hatch and told the two inspectors inside what my interest was. The two inspectors inside, T. Horeff (FAA) and J. Leak (CAB) were trying to trace the fire ignition and direction. The inside of the cabin was badly sooted. They asked me if I knew what the various equipment and materials were, and I said, "I can identify some of them." "What is this tank?" they asked. I said, "That is the 900 psi oxygen pressure vessel made of Inconel 718 and quoted its strength and melting point. They pointed to a hand controller which had a corner knocked off of it. I said, "That is a hand controller, I don't know which one it is (rotational or translational), but it is made of 6061-T6 aluminum. They asked why the corner broke off. After looking at it, I said, "This alloy is prone to cracking in the 950-1,150°F range under thermal or mechanical stress." One of them then said, "Get your ass in here! I want you to map the temperature of everything in the Command Module." I was grateful, for I realized that the Command Module could accommodate only a few people on a need-to-know basis, and I was able to enter it every day and catalogue my findings.

One of the first things I requested from Panel 8 was a literature search on oxygen fires. Almost immediately, we learned of a fire in a 100% oxygen chamber which occurred on January 31 (4 days after the Apollo fire) at Brooks Air Force Base in San Antonio, killing Airmen William Bartley and Airman Richard Harmon. (They were in the process of drawing blood samples from rabbits when the disaster occurred.) Unknown to us at the time, Soviet Cosmonaut Valentin Bondarenko died in March 1961 in a fire in an oxygen chamber.

Shortly after this, I was given a film made by the Canadian Air Force about 100% oxygen fires. I showed it to Frank Borman who was the Astronaut representative investigating the fire. A dead pig was dressed in a flight uniform with an igniter placed at the bottom of one pant leg. High-speed photography was used. (I don't recall the oxygen pressure.) Within 2 seconds the uniform was turned to dust. The fire was like a flashbulb going off. Each fiber sticking up on the uniform surface instantaneously caught fire and a million ignition sites burned toward each other (similar to singeing the hair on your arm while charcoal grilling).

In the second test, the suit was borated to make it fireproof. This was even worse, for a two-foot tongue of flame leapt out each arm sleeve, each pant leg, and out of the neck of the suit. The hair on its body burned, eventually catching its skin on fire. Frank seemed unimpressed and was particularly annoyed that they put a pig into a flight suit.

Obviously, Mercury and Gemini successes with 100% oxygen gave them false confidence. After this fire, Deke Slayton claimed that "they had been lucky (up to this time) for they used the same oxygen procedures for the 16 Mercury and Gemini manned vehicles." It should be noted this particular Command Module had survived greater than 14.7 psi pure oxygen atmosphere for a total time of 6 hours and 15 minutes in four previous KSC altitude chamber tests.

Over the next week I gathered information about the temperatures of everything in the Command Module including melted wires, melted stainless steel, melted aluminum, and melted plastics. I also recorded evidence of mechanical damage to everything visible, including knobs.

While it would take too long to describe all the findings, I found melted 1/8-in. diameter stainless steel tubes (~2,600°F) below the gas chromatograph of the ECU. I also found gas chromatograph wires and wire bundles under the ECU where copper melted, but the outer coating of nickel stayed intact (1,980-2,650°F). I found at least 16 areas with melted aluminum (above ~1,200°F) and two areas of overheated, cracked aluminum (950-1,150°F). There were soldered fittings parted and even melting of aluminum tubes in the ECU water, ethylene glycol, 100 and 900 psi oxygen lines running under the ECU. The inside of the Command Module looked like someone had used a blow torch, with some areas totally destroyed while adjacent areas were essentially unscathed. Perhaps, it was caused by a torch effect of 900 psi or 100 psi oxygen lines and squirting of ethylene glycol throughout the cabin. It is of interest to note that nine months before the fire, on April 28, 1966, AiResearch had a fire destroying an ECU during a test in 100% oxygen at 5 psi pressure.

Equipment Removal and Inspection

It was decided that all equipment within the Command Module would be removed, examined and tested. Command Module 14 was sent to the Cape to use for practice on disassembly of the equipment. Procedures were written and pictures were used to document all steps of the removal process. Some 600 pieces were removed, inspected, continuity checked, tested, and disassembled. I looked at every piece of equipment and I am not aware of problems with anything except the ECU.

Newspapers

The media was so anxious to have news of what we found that they created it. My first week was spent in cataloging temperatures and mechanical damage to parts in the Apollo Command Module, The Material Panel (Panel 8) was busy identifying materials and writing test programs, another panel was writing procedures for equipment removal, etc. Thus, for two weeks the local press got no news. Every day I would read in the paper of some major discoveries, all of which were the products of creative writing. If there was no news, the media simply made some up!

Findings

There were 2,528 products identified in the Command Module that were potentially combustible: oils, foams, fabrics, Velcro, elastomers, paints, laminate, etc. An additional 75 materials were brought into the cabin after delivery of the Command Module to KSC. These potentially combustible materials weighed about 72.5 lb of which 17.2 lb were government furnished (garments, visors, etc.).

Ignition – While we examined possible mechanisms for ignition of the fire: 1., electrical spark; 2., static electric spark; 3., mechanical spark; 4., impact ignition in oxygen; 5., spontaneous ignition; 6., overheated hardware; 7., pyrophoric chemicals; and 8., spontaneous combustion (delayed ignition); we could find no positive evidence of these. The Material Review Panel conducted 618 tests trying to investigate ignition and propagation phenomena. Tests included propagation rates, flash and fire point, and spark ignitions.

We knew that metal, such as titanium (sometimes aluminum) could ignite by impact in oxygen. We knew that spills of ethylene glycol can corrode electrical wires and dried spills contain conducting salts, which can short wires and which are flammable (from the stabilizers and anti-corrosion chemicals added to it), and we had a history of spills (90 oz in 6 spills), but they were all properly cleaned up. In short, we could not conclusively pin down the initiation event. Tests showed that mechanical impact ignition occurs in Velcro and Raschel Knit (used for debris bags) in standard impact testing equipment (72-ft-lb) in a 14.7 psi oxygen atmosphere. The literature shows that PVC wire insulation, when wetted with ethylene glycol and shorted, can burst into flames. We, however, used Teflon insulation, and we could not duplicate such failures with breaches in Teflon coated wires under spacecraft conditions.

Testing showed that solvents like MEK, though absorbed by Velcro, uralane foam, and couch materials would not remain in the spacecraft. Only nylon materials could generate a static electric spark. Sufficient electrostatic energy (~4 mj) could be stored in the suited astronaut to ignite MEK and methane vapors in 14.7 psi oxygen. Removal of DC electrical connector plugs could not generate a spark to ignite these gases, even at 2.5 times nominal power. No auto ignition or spark ignition of plastic materials occurred in 400°F tests, even if treated with cleaning solvents. Wire bundles were tested to see if sparking from shorting could ignite wire insulation. In a special test, the Teflon insulation on a wire was cut and intermittently sprayed with water glycol for 8 hours until it did ignite in 14.7 psi oxygen and less than 5 amps in the conductor. This test condition was considered unrealistic.

Propagation – Tests proved the burning rates in 16.7 psi oxygen typically occurred twice as fast, compared to 5 psi oxygen, and in some cases, materials sputtered or nearly exploded in this environment when set afire. No melting of aluminum tubes occurred from burning foam insulation tests. Although, water/glycol leakage was a concern, six spacecraft to date had water/glycol leakage of a total of 320 ounces, all of which were cleaned up and no wire bundle or cables failed. In 14.7 psi oxygen, dried films of water/glycol exposed to vacuum for extended periods of time will propagate a fire if ignited. The readily flammable materials: debris nets, Velcro, foams, coach materials, and nylon suits all burned in the spacecraft; whereas, Teflon coating on wires did not appear to propagate a fire. Thermal calculations indicated combustion of 3.8 ounces of either Velcro or Raschel Knit would generate sufficient heat to raise the cabin pressure from 16.7 psi to ~36 psi in less than 14 seconds, more than enough to blow the Command Module. This would use up less than 2% of the oxygen! However, in 5 psi oxygen, it would require at least 80 seconds for the cabin to fail.

Contractual Requirements – There were no specifications imposed on the Apollo contract prior to the fire with regard to material selection and flammability in oxygen. While it was known virtually all organic materials burn in oxygen, spacecraft design concentrated on avoiding ignition. There was no accounting of materials in the vehicle or control of the placement of organic material.

Summary

Although no specific cause was singled out as the "smoking gun", all indications are that the fire initiated near or below the ECU on the lower left side of the Command Module. Temperatures in this area exceeded 2,600°F.

The spacecraft fire spread rapidly by igniting nylon Velcro, Raschel Knit debris nets, insulation foams, and couch materials. When the cabin blew, flames rushed out and showed burn flow patterns from left to right. It is possible to cite 20 or 30 things that contributed to the disaster. But I will just point out the most salient that were evident to me:

1. The use of 16.7 psi oxygen on a ground test was a tremendous risk. Neither NAA nor NASA classified the test as "Hazardous". Not only did higher oxygen pressure increase combustion rates but the 2 psi delta pressure over ambient air pressure made it impossible for astronauts to remove the inner hatch, since the hatch is removed inward. Nearly 1800 pounds of force would have been required to remove the hatch.
2. NASA success with on-the-ground 16.7 psi oxygen testing on the 16 Mercury and Gemini manned vehicles brought complacency and a false sense of security.
3. I don't think anyone had calculated before the test that the burning of 3.8 ounces of plastic material would actually blow up the Command Module or that the vent was insufficient to handle a fire in 16.7 psi oxygen.
4. NASA's insistence on an inner opening hatch and rejection of an emergency explosive hatch contributed to the disaster. Also their refusal to consider a fire suppression system and to permit oxygen fire technology studies also may have contributed.
5. There was no Fire and Rescue Crew, nor was a doctor at the scene, as required by NAA in tests run in experimental aircraft when the cabin hatch is shut.
6. The aluminum soldered joints were known to be good to 190°F, above the maximum temperature allowed for the spacecraft walls. They were easily damaged by technicians grabbing on to them (causing leakage) and simply could not survive a fire of this magnitude.
7. KSC exhibited no control over materials entering the cabin. For example, they used duct tape over foam pads for providing kneeling pads. The wall-to-wall Velcro and the large debris net insured a propagation path for the fire by acting like a fuse. These were requested by astronauts who were bothered by floating tools and parts in space. The total quantity or configuration layout of plastic material was not was not considered in initial design in Downey.

Vehicle and Procedural Changes

Of the many changes made, the most significant were:

1. Redesigned Hatch. A new unified outward-opening hatch was designed and built which opened both hatches together within 7 seconds. It added 30 lb to the Spacecraft.
2. Launch Gaseous Environment. Procedures were changed to use a 60/40 oxygen/nitrogen mixture on the ground. As the vehicle ascended, the pressure would be reduced and the nitrogen would gradually be replaced by oxygen.
3. Highly Combustible Materials Eliminated. Nylon and other highly combustible materials were eliminated. The astronaut suits were changed to beta cloth, a fiberglass fabric coated with Teflon. Fiberglass materials were used on the seats.

   All electronics had been conformally coated with RTV 560. Complaints were that the RTV conformal coating burned in the fire, but having examined nearly 100 examples, I could only find thin whitish-gray surface flakes on the RTV. Nevertheless, Ladicote (a Viton paint plus fire retardants) and a carboxyl nitroso rubber were over-coated to protect the RTV.
4. Additional Material and Design Controls. A material selection spec with restrictions on burning rates in the oxygen atmosphere was issued. This was done by categorizing applications. For example, the couches, with a large area of organics would be rated Category A, and would have to meet some very limited burning rate requirement.

   A final walk-through inspection by NAA and NASA would pick up dangerous arrangements or proximities of materials.
5. Protection of Soldered Joints. Soldered joints on aluminum tubes were protected by bonding epoxy fiberglass clamshells over them, protecting them from the heat or aluminum lines were replaced by stainless steel lines.
6. Safety Procedures Revised. Future procedures classified this test as "Hazardous", requiring fire and rescue crews and a medical doctor's presence. Jellied water-type fire extinguishers were developed for in-spacecraft use.

   Back-up oxygen supplies were added to the spacecraft.

Epilogue

When a tragedy occurs, two kinds of investigations occur. The Apollo 204 Review Board was interested in the technical aspects of the problem-the initiation of the fire, the exacerbating circumstances, what lessons were learned, and what changes needed to be made. Congress, on the other hand is composed of lawyers who can't grasp the technical problems or the complexity of the program. Rather, they wanted to know who is at fault, so the guilty party or parties could be chastised, fired, and publically humiliated, making it appear that Congress was doing its job. It is similar to the rejection of a top coach who loses the NBA playoff game and everyone wants to fire him, regardless of his season record. So it was with this investigation. NASA was determined not to look bad and their Panels were headed by KSC and MSC Chairmen. Only the KSC and MSC Panel Chairmen were in charge of writing the final Panel reports. Many thought it was wrong that NASA was investigating itself, but I found they actually did a credible job.

There was, however, a forced bias; the word was around that, under no circumstances, could an astronaut be blamed, for they were public icons, and besides, they were killed and couldn't defend themselves. Frankly, some thought this was terribly wrong. If a driver was killed in an auto accident, he still could be determined to have been at fault. If a pilot made an error, causing an airplane to crash, should he not be held accountable? We call it "pilot error".

When Congressman William Fitts Ryan was told we didn't conclusively know the cause of the disaster, Max Faget stated that it probably started in the ECU area and that a bundle of wires was below an access door and opening the door might have caused chaffing of the electrical insulation (pure speculation)! NAA personnel inspected the bundle on the morning of the fire when they replaced air filters and there was no such chaffing of the bundle. When Ryan asked if there was another possibility, John McCarthy, a NAA Engineering Vice President, pointed out that the gas chromatograph had been removed that morning and sent back to the factory for refurbishment. The electrical connector to the gas chromatograph was "live" (had power on it). Gyro data shows that Gus Grissom left his couch. This connector was near his feet as was the ECU. Suddenly, there was a current surge recorded just before Gus got back in his couch. Shortly thereafter, fire was reported in the cabin. I tend to think this is a plausible scenario, especially since the Command Module had previously been subjected to four altitude tests at the same pure oxygen pressure level for a total of 6-1/4 hours with no problems. The only test difference was that the gas chromatograph was gone and a live connector was at its base. (If this actually did happen, Grissom had no reason to believe either a live connector existed or that it would cause any problem.) When Congressman Ryan heard McCarthy's alternate explanation, he went ballistic and condemned McCarthy for even implying Gus Grissom could be involved. Gus was a seasoned pilot who flew 100 missions in Korea, won the Distinguished Flying Cross, and flew in both the Mercury and Gemini spacecrafts. A few minutes after McCarthy's comment, Congressman Ryan publically berated NAA before the press outside the room.

The question that loomed is who would take the blame, NASA or NAA. NASA publically claimed NAA did shoddy work on the spacecraft. Several higher level management people had enough information that they could have severely embarrassed NASA in public. For example, Charlie Feltz stated that nowhere in the Apollo spec were we to design for 16.7 psi pure oxygen on the ground.

But NAA upper management had what I call a "Hamlet Moment". Hamlet said, "Whether 'tis nobler in the mind to suffer the slings and arrows of outrageous fortunes, or to take up arms against a sea of trouble, and by opposing them, end them!" We decided not to oppose them. NAA agreed to accept the blame. Many of us were disheartened. I wanted to write an article for Life Magazine telling them all the things NASA did wrong, but I didn't. I recognized there is a time to bite your lip and take the blame. I thought that if the country thinks NASA is careless or incompetent, they might cancel the Apollo Program, but if they think NAA was sloppy, NASA could either shape up NAA or put a contractor over us.

Incidentally, John McCarthy soon left NAA after the comment. Those in power tried to have Joe Shea, NASA Apollo Program Manager, examined by a group of psychiatrists. NASA removed him. Stormy was the whipping boy for NAA and was moved aside. Ironically, Bill Bergen, the Martin President, who lost the bid for the Apollo to Stormy, became our NAA Space Division President.

Finally, I think this fire saved the Apollo Program. We were being pushed too rapidly by schedule pressures in efforts to beat the Russians to the moon. Our hardware wasn't really ready, nor was that of the Lunar Module. Many glitches had to be shaken out and we spent the next 21 months making sure that the hardware was top-notch. George Low of NASA described the complexity of the lunar spacecrafts as: "two machines, 17 tons of aluminum, titanium and synthetic materials, 33 tons of propellants, 4 million parts, 40 miles of wire, 100,000 drawings, 26 subsystems, 678 switches, and 410 circuit breakers."

Fortunately for us, three months later, on April 23, 1967, Russian Cosmonaut Vladimir Komarov was launched in his Soyuz 1 spacecraft and half of his solar cells didn't deploy. He could not stabilize the craft in orbit. After 17 orbits, he reentered, but his parachutes lines became entangled and he plunged to the ground at more than 200 mph. The Russians had to go back and do their homework. In October 1968, both the Americans and Russians finally resumed manned flights ...and the race to the moon was back on!

About the Author: Larry Korb was the Supervisor of the Apollo Metals & Producibility Group in Apollo Materials and Processes.

NAA DAY AT WESTERN MUSEUM OF FLIGHT

The Western Museum of Flight will celebrate a North American Aviation Day on Saturday, October 9th in recognition of the 70th Anniversary of the first flights of the P-51 Mustang Fighter and the B-25 Mitchell Bomber. October was the month that the first P-51 was flight tested (NA73). To make the event even more memorable, the Museum's operational P-51 will be dedicated to Edgar Schmued, the Chief Designer responsible for the design of the P-51. Also on display will be an F-86F Sabre jet fighter that should bring many memories to many of the NAA visitors.

To complete this celebration, NAA Test Pilot Bob Hoover has agreed to be the Grand Marshall. Arrangements are also being completed to display other NAA aircraft including several T-6 Texan trainers, a T-28 Trojan trainer, a B-25 Mitchell bomber, a Navion and, hopefully, a Sabreliner. The museum is located on the south side of the Torrance Airport (Zamperini Field). The address is 3315 Airport Drive, Phone No. (310) 326-9544, *www.wmof.com*. There will also be many other vintage aircraft and jets on display.

To offset the costs of flying in the various aircraft, there will be an admission charge of $10.00 per Adult, $4.00 per Student and Children under 12 for Free. Assisting the museum in this noble endeavor is our NAA Retiree, Earl Theaker. Earl can be reached at (310) 326-3180 or *etheaker@sbcglobal.net*.

REMEMBERING A PRODUCTION DEVELOPMENT LABORATORY MOMENT!

In 1951, I joined NAA in Downey as a Stressman "B" on the Navaho project in Downey. In 1954, there was a issue on the factory floor and I was invited to join Quality Control as a Material Review engineer. As an incentive to make the change, I was offered a Specialist rating which entitled me to a "Grey Badge"—at the time considered quite a coup.

One of the more interesting features on the factory floor was a huge acid bath where large sheets of metal could be placed in a metal cage and lowered into the bath to clean off the surfaces and then be brought out and hosed down.

Much of the Navaho booster consisted of two long aluminum tanks, each consisting of four long quarter sections which, when welded together, formed a large cylindrical or conical tank. A huge clamping rig was devised to hold the sections together rigidly and then to weld them together longitudinally and then circumferentially to the other tank. To attain a reliable weld, the edge of each quarter section had to be quite thick but the remainder could be thin and still comply with strength requirements at a much reduced weight. Unfortunately, since the sections had already been formed into cylindrical and conical shapes there was no means available to machine out the excessive material.

A chemist came out to the shop floor from the PDL to evaluate the situation. His name was Manuel Sanz. Manny took some notes and said, "I'll be back!"

A few days later, he returned with a plastic spray which was impervious to acid. He sprayed the entire both sides of a 20-foot quarter section. He, then, taped a pattern to the outside of the section which came inches away from the edges and ran an X-Acto knife around the pattern. He then removed the pattern and peeled off the plastic that was covered by the pattern. The section was now placed in the cage and lowered into the acid vat. Using a stopwatch, he timed the immersion in the acid and then brought up the section and had it hosed down. Removing the rest of the plastic, the quarter section emerged with thick edges suitable for welding and a perfectly fashioned thin skin.

Manuel Sanz had just invented Chem-Milling.

—Ed Rusinek

Contrails From The Past

by Ed Rusinek

Dear Ed,

The Columbus Division of NAA is long gone but a few of us still gather monthly for lunch and to talk about old times. We recently gathered at the home of Denver Santee in Westerville, OH. Gathered together, left to right, we had Ron Tague, Oren Dewey, Denver Santee, Jim Shaw, Paul McCormick, Nolan Leatherman and seated, Ray Bott.

Jim Shaw, Westerville, OH



Ed's Resp.: We are always glad to hear from NAA folks that are alive! We have too many in the Silent Majority.

Dear Ed,

At 94, I will soon be retired for as long as I had worked. I began my career in 1937 at the Consolidated Aircraft Company in San Diego where I now live in a beautiful retirement community.

Although I spent time in the Space Division and the Ocean Systems Division—most of my career at NAA was in Preliminary Design at LAD up through the F-108 Mach 3 interceptor.

Charlie White, Spring Valley, CA

Ed's Resp.: You are 94 years young! Charlie, sounds like you have a perfect retirement!

Congratulations and Best Wishes to

Charles and Mary Joyner of Granbury, Texas celebrating their 65th Wedding Anniversary

Virgil and June Crawford of Gold Hill, Oregon celebrating their 62nd Wedding Anniversary

Angelo and Barbara Martignoni of Fountain Valley, California celebrating their 60th Wedding Anniversary

May you have
Enough happiness to make you sweet,
Enough trials to make you strong,
Enough sorrow to keep you human,
And enough hope to make you happy.

The Silent Majority

by Stan Guzy

ANDERSON, ROBERT C., 62 – died in Quinta, CA on March 20, 2010. Bob retired from Downey in 2001 where he was a property administrator.

BEERER, JOSEPH G. "JOE", 96 – of Santa Barbara, passed away on May 31, 2010. After graduating from New York University in 1936, Joe went to work for the Glenn L. Martin Company in Baltimore, MD before joining the new McDonnell Aircraft Corp. in St. Louis, MO as an expert in aircraft engine cooling systems. In 1940, he was hired by NAA as the Chief Thermodynamicist with the assignment to solve the complex coolant problems with the P-51 Mustang fighter. He went on to become the president of the NAA Missile Division, responsible for the Navaho and the Hounddog missiles. Joe retired in 1962 as corporate vice president of engineering. He is survived by his loving wife of 71 years, Virginia.

BISHOP, C. R. "RON", 77 – died in Fountain Valley, CA on August 4, 2010. He joined the NAA Production Development Laboratory on the X-15 program. Ron gained recognition in the Industry for his expertise in Non-Destructive Testing. He progressed through management on the B-70, Saturn/Apollo and Space Shuttle programs. He retired from Space Division in 1990 as Director of Quality Assurance with 32 years of service. Ron is survived by his loving wife of 51 years, Irmgard. He was a good friend. Good night Ron.

BROWN, GEORGE H., 85 – passed away on May 22, 2010 in Little Company of Mary hospital in San Pedro, CA. George was an electrical engineer with NAA for 36 years until his retirement. He is survived by his wife Maxine.

CHAVEZ, RAY, 86 – Bulletin returned, later notified that he passed away in Long Beach, CA in January 2010. Ray retired from Autonetics in 1987 with 40 years of service.

CHRISKE, JOHN "JACK", 75 – passed away in Riverside, CA on March 17, 2010 from a cerebral hemorrhage. Jack attended Michigan State University on a baseball scholarship and joined the U.S. Navy. He qualified to serve aboard nuclear submarines and was involved in covert operations with the U.S. Navy SEALs off the China coast during those critical Cold War years. After the service; he completed his education at Cal Poly San Luis Obispo, earning degrees in Electrical Engineering and Advanced Mathematics. Jack joined Autonetics, working on the F-105 fighter program. He later transferred to the Space Division to join the Apollo Ground Support Equipment (GSE) management team. He subsequently moved to the Shuttle Program as Engineering Manager of GSE before retiring in 1991. He was recalled to provide his expertise on the Soviet MIR/Space Station Program. Jack is survived by his loving wife of 52 years Patricia.

COOPER, WIL – Bulletin returned stamped "DECEASED". Our records indicate Wil retired from the Space Division, Seal Beach Facility in 1983 after 21 years of service.

DANIEL, PHILLIP G., 90 – of Hawthorne, CA passed away on May 12, 2010. Phillip was an engineer and retired in 1980 from LAD with 40 years of service. He is survived by his loving wife Helen.

EVANS, EDWIN T. "TED", 91 – succumbed to cancer in Newhall, CA on June 5, 2010. Ed retired as Vice President of Manufacturing at LAD in 1970 after 33 years of service.

FOURNIER, F. "FRENCHY" – a note from Frenchy's wife indicated he had passed away on January 7, 2009. He had retired from Autonetics in 1984 after 36 years of service.

GAMBLE, LAVERN R., 82 – passed away on July 28, 2010 in Redondo Beach, CA. After serving in the Navy, he joined NAA as a Flight Simulator engineer technician for 38 years. Vern is survived by his wife Shirley.

GATTO, ANTHONY R. "BOB", 80 – of Torrance, CA passed away on July 10, 2010. Following his discharge from the U.S. Marine Corps Bob joined Rockwell International as a manufacturing engineer. He retired after 33 years of service and started a second career in the television and film industry as a stand-in double. Bob was preceded in death in 1992 by his wife, Verna.

HANSEN, ROBERT M., 91 – of Palmdale, CA passed away June 26, 2010. Bob joined NAA in 1936 as a riveter and served 43 years until he retired in 1979. In that time, he worked on the B-25, P-51, F-86, X-15, B-70, B-1, Apollo, and Space Shuttle. Bob spent 5 years in Spain, helping a Spanish company modify F-86s and F-100s for the USAF. During this period, he advanced to General Foreman of the Machine Shop at LAD and Director of Final Assembly in Palmdale. He was preceded in death by his loving wife Audrey.

HEARN, BOB LEE, 75 – Bob was born in Tulsa, OK and migrated with his family to California during the dustbowl years. He passed away on July 20, 2010. After serving in the U.S. Army in the Korean War, he joined NAA/RI and served for nearly 40 years before retiring. After retiring, he became interested in California Impressionist art and was active in community charity work. Bob is survived by his wife of 49 years, Lynn.

HENDERSON, JOHN L., 90 – of Ventura, CA passed away on May 31, 2010. John served with the Army Air Force Technical Training Command before joining NAA in 1946. He became leadman-crew chief in Production on the FJ-1 Fury and F-86A Sabre. Transferring to Field Service, he became a Tech Rep supporting newly equipped F-86A squadrons assigned to the 4th Fighter Group at Langley, VA. This tour lasted 30 months, including 13 months in Korea. He was the first F-86 tech rep to participate in the support of the first air-to-air engagements between the Soviet built MiG-15 and the F-86 in December 1950. John provided this bio with the article he submitted to the NAAR Bulletin in 2001. He is survived by his loving wife of 66 years, Barbara. Good night John.

HEYWOOD, WILLIAM – Bulletin returned stamped "DECEASED". Nothing further available, his mailing address was Hemet, CA.

HODGETTS, KELLEY, 60 – passed away on July 8, 2010 in Burbank, CA. Kelley worked on the GPS systems in the laboratories at Seal Beach. He is survived by his wife Darlene.

HULICK, RALPH – Bulletin returned marked "DECEASED". No further information available.

HUSTER, HOWARD H., 93 – passed away in Chicago Ridge, IL on March 23, 2010. Howard retired from the Sabreliner Program in 1981 with 41 years of service.

KNOWLDEN, FLOYD H., 83 – passed away from undisclosed causes on April 11, 2010. He served in the U.S. Army

Air Forces during WWII. Floyd obtained his engineering education at UCLA and worked at NAA/RI for 30 years on a variety of Space Programs, including Saturn, Apollo and Shuttle Orbiter. He retired at the age of 82. He leaves behind his loving wife of 35 years, Joanne.

KRAGH, JAMES "JIM", 81 – of Torrance, CA passed away on April 17, 2010. Jim was a hydraulics engineer on the F-86, B-1, and B-70 before retiring from LAD in 1990 with 39 years of service. He is survived by his loving wife Evalyn.

KULUSCH, LOUIS "LOU", 84 – died at his home in Newport Beach, CA on July 26, 2010. He retired from Rocketdyne in 1988 with 22 years of service. He is survived by his wife Joyce.

MEADE, JEROME J. "JERRY", 74 – of Westminster, CA passed away on June 18, 2010 in Duluth, MN. Jerry started his life in California as a roughneck in the oil fields. He obtained a degree and joined RI as a safety engineer and advanced to supervision in human resources. After retirement, he had a very active role in Westminster civic affairs.

MEYER, LESLIE C. "LES", 78 – passed away at home in Pismo Beach, CA on February 2, 2010. Les joined NAA in 1958 as a structural engineer and computer specialist, conducting structural tests on several classified projects. He retired from Space Division in 1988 with 29 years of service. He is survived by his loving wife of 52 years, Dorothy.

MICHEL, VICTOR J., 83 – of Saint Peters, MO passed away peacefully at home of respiratory failure on June 2, 2010. Vic retired from Defense Electronics Operations at Autonetics as Manager of the Technical Information Center in 1984 with 30 years of service. He is survived by his loving wife of 59 years, Margaret.

NUNNALLY, JACKSON L., COL. USAF, 85 – a patriot to the end, Jackson passed away on July 4, 2010 in Huntsville, AL. Jackson flew P-40s and P-51s during WWII as a fighter pilot. He received his aero engineering degree from the University of Florida and then became a fighter pilot in the Korean War, flying F-80s. Between wars, he flew acrobatics as a member of the Florida Rockets. Jackson joined NAA in 1956 as a test pilot. He was the F-100 chase pilot for the Hounddog WS-131B Program, later ferried NAA personnel aboard a C-54. Retiring from the USAF in 1976 with the rank of Colonel, he retired from Rockwell International in 1987 with 13 years of service. Jackson is survived by his loving wife Eva Mae.

PATTON, W. GLENN, 87 – died on May 1, 2010 in Santa Ana, CA. Glenn retired from B-1 Division in 1986 with 26 years of service. He is survived by his wife Eva.

PEARCE, CHARLES W., 94 – of Terre Haute, IN passed away on June 10, 2010. After graduating from Curtiss Wright Technical Institute in 1942, Charles joined Bell Aircraft where he worked on the first American jet fighter, the P-59. He joined NAA in 1944 and was assigned to the design of the P-82, which consisted of two P-51s connected by an airfoil. Subsequently, he was assigned to the F-86 designs, Models A through H. Charles volunteered to move to the new Columbus facility in 1952. With contract cancellations, his career spanned service with Lockheed in Marietta, GA, Fairchild Hiller in Hagerstown, MD, and LTV at NASA Langley Research Center. He retired from the Columbus Division in 1974 with 24 years of service. He is survived by his wife Ruby.

PRICE, WILLIAM E. "BILL", 78 – passed away in Kurten, TX on June 24, 2010. Bill joined NAA in 1964 as a member of the NAA Test Team at NASA-Houston on the Apollo Thermal Vacuum Program testing of S/C-008 and 2TV-1. Later, he moved to the Shuttle Avionics Integration Laboratory (SAIL) as a test conductor. He then transferred to the Rockwell KSC Test Team, working on the Orbiter test and checkout teams preparatory for launch. He retired from Rockwell with 28 years of service. He is survived by his loving wife Alandra.

PURPURA, FRANK A., 90 – of Placentia, CA passed away on August 11, 2010 after a long battle with cancer. After serving in the Navy during WWII, Frank joined Autonetics where he served as a project administrator in Logistics. He retired in 1990 with 37 years of service. Frank is survived by his wife, Gerry.

SANBORN, MORGAN W. "SANDY", COL. USAF, 78 – passed away in San Antonio, TX on June 21, 2010 after a protracted struggle with Parkinson's disease. Entering the Air Force in 1954, his career spanned many stations and assignments including flying F-89s over Panama City, FL, flying F-102s over Newfoundland, industry liaison at Vandenberg AFB, base commander of a radar installation on Eleuthera Island in the Bahamas, being a forward air controller over Vietnam flying the OV-10 Bronco, and lastly, "flying a desk" in the Pentagon. After retiring in 1979, he joined Rockwell International as project engineer on the Space Shuttle. Sandy retired from Rockwell in 1990 with 11 years of service.

SCARFONE, LAWRENCE L., – passed away on June 7, 2010 from undisclosed causes. He proudly served as a paratrooper in the U.S. Army Airborne Divisions during WWII in Europe. He retired from NAA/RI after many years of service. He is survived by his wife, Doris.

SHORT, DORIS J. – of South Gate, CA. Notified by the executor of her estate that she passed away in September 2009. Doris retired from Space Division with 38 years of service.

WELCH, JOHN L., 89 – of Anaheim, CA passed away on June 17, 2010. John served in the Pacific during WWII where he received the Bronze Star. Graduating from the University of Missouri. He joined Autonetics in Procurement and Quality Assurance and served for 25 years before retiring.

ZUG, DONALD L. 78 – of Fullerton, CA passed away on June 3, 2010. Don joined Autonetics as a fireman and retired as a fire chief in 1994 with 34 years of service. He is survived by his wife Carole.

LOST SHEEP – BULLETIN RETURNED WITH NO FORWARDING ADDRESS

ROBERT A. BROWN – SEYMOUR, TN

KENNETH L. PIERCE – YUMA, AZ

W. E. THIBODEAU – BOZEMAN, MT

NORTH AMERICAN AVIATION
RETIREES BULLETIN
P.O. Box 3797
Seal Beach, CA 90740

North American Aviation Retirees Bulletin
"WHERE THE BEST NEVER REST"

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Photos via Ed Venanzi

1,000 Autonetics retirees, some in wheelchairs and some with walkers, attended the unveiling of the Autonetics Commemorative Monument on August 3, 2010 at the former Autonetics site in Anaheim. It was their final farewell to the most ingenious engineering organization ever devised where nothing was impossible and if it didn't exist, it was invented on schedule! The retirees are old now and many are gone, but the impacts of their triumphs are still very evident in every field of human endeavour. Designated as a Boeing Heritage Site, the 72-foot long monument is located at 3195 East La Palma Avenue. All Autonetics Retirees, Well Done!

NORTH AMERICAN AVIATION
Retirees Bulletin
"Where The Best Never Rest"

Winter 2010

Inside:

WINNING THE SHUTTLE ORBITER PROGRAM by John Sandford

HOW WE LOST OUR NAME AND OUR HERITAGE by John Moore

NASA RESPONSE TO APOLLO 1 FIRE REPORT by Gary Johnson

DESIGNING THE XB-70 FUEL SYSTEM by Cleve Kimmel



Painting courtesy of Artist Ronald Wong

The No. 315 RAF (Polish) Deblinski Squadron, named for the City of Deblin, was the sixth RAF Polish fighter squadron composed of Poles that fought over Poland, France, and England. Flying the Mustang Mk III, the squadron's primary role was to patrol against the V-1 flying bombs and to escort bombing missions over occupied Europe. The legendary Squadron Leader Eugeniusz "Dziubek" Horbaczewski, who was credited with 16.5 aerial victories plus the downing of 4 V-1s, led No. 315 Squadron. The outstanding battle for No. 315 Squadron occurred on August 18, 1944 when it engaged over 60 Luftwaffe fighters over Beauvais, France and destroyed 16 Me 109s and Fw 190s for a loss of only one of their own, which sadly was that of Dziubek himself. The squadron is portrayed escorting Lancaster bombers over the Dutch coast during the summer of 1944 by British aviation artist Ronald Wong in his painting "Dziubek's Deblinskis".

NORTH AMERICAN AVIATION
Retirees Bulletin

North American Aviation Retirees Bulletin, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

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Dear NAA Retirees Bulletin Subscriber

With this issue, we have completed ten years of publishing the North American Retirees Bulletin on our own. No small accomplishment when you consider that Boeing cut us loose after only one issue in 2000. We gathered enough funds to send out one free issue to the 9,300 retirees that were receiving the free NAA Retirees News. More than 3,000 of you responded with encouragement and checks! Five of us took up the challenge and here we are! But we would not have made it without a fantastic group of supporters—the authors, historians, publishers and artists—who so generously provided us their time, their talent, their treasure and, most importantly, their hearts! Many are no longer with us and others had no previous connection with North American Aviation; but, to us, all are North American Aviation Family. God bless them all!

Once again, on the cover, we have another colored portrayal of the P-51 Mustang in action! It is a painting done by English aviation artist Ronald Wong. It is of a squadron of Mustang Mk IIIs, flying under RAF Polish colors, defending England against the German V-1 flying bomb and English bomber squadrons against the Luftwaffe. Tallyho!

As we review the articles submitted by our authors, we stand in awe at the superb talents that NAA recruited and utilized to produce the finest airplanes and space ships in the world. Readers will recall Cleve Kimmel with his splendid story on the X-15. Well, he is back with us to report another brilliant engineering feat—designing the B-70 fuel system. Even if you are not familiar with fluid mechanics, you will have to admire Cleve's spirit and patience.

You may be the best aerospace company in the world but if you don't win the contract, you are just a dusty memory on some bookstore stockroom shelf. John Sandford with the assistance of his good friend and colleague, George Fraser, provides us with a tremendous insight into what it took to win the Space Shuttle contract! It is victories such as these that decided whether thousands of folks like us had a job or not! John and George were at the forefront of this nail biter!

Over the years, many of you have asked how it came about that we lost our name, North American Aviation, Inc. and, in a sense, our heritage! Autonetics President John Moore covered this very painful subject in detail in his 2002 article in the Bulletin. We have excerpted the segment of his report that covers this dastardly deed! (Gad! I never thought I would ever have a need for that word.)

If you could attend and you missed the North American Aviation Day at the Western Museum of Flight last October 9th, you missed a historical moment! There was a bevy of NAA airplanes on display and many looked better than the day they were rolled out of the factory! Bob Hoover, God bless him, was the Grand Marshall and he gave a very moving and poignant talk. Other familiar faces included Dale Myers, Jim Brooks, John Sandford, Ed Kaston, Joe Onesty, Lowell Ford, Earl Theaker, Rolf Schmued and "Bernie" Fricke (she was a design engineer at LAD on the P-51).

Again, at this time of the year, we must mention that for many of you it is time to renew your subscription. If above your name and address it says: December 2010, this will be your final issue and you must renew to continue receiving the Bulletin. Please save us the time and money to send you reminder cards that you still have not paid by sending us your renewal check as soon as possible! Don't even bother cutting out the coupon on this page. Simply, send us your check and Sonnie will do the rest! Stan Guzy has to prepare our Non-Profit Tax return and Sonnie Robertson has to update hundreds of paid subscriber names this time of the year so their time and efforts are focused on those tasks. While you are at it, check with your retiree friends and if they still are not subscribers, add to your renewal check another $15.00 per friend. We shall send them a nice letter with the news of your generous gift and a copy of this Winter 2010 issue plus the four issues in 2011. It will be the cheapest Christmas gift you will give and, probably, the most appreciated.

With the year drawing to an end and the Holidays approaching, may we bestow on you, our faithful and loyal readers, whatever your belief or faith, the following old Irish Blessing:

May God guard you
through every night and day
And ever watch above you.
God smile on everything you do.
God go with you.
God love you!

Winning The Shuttle Orbiter Program

by John Sandford

Author's Note: With the final Space Shuttle launch now only months away, we thought it would be of interest to reflect upon how it all began.

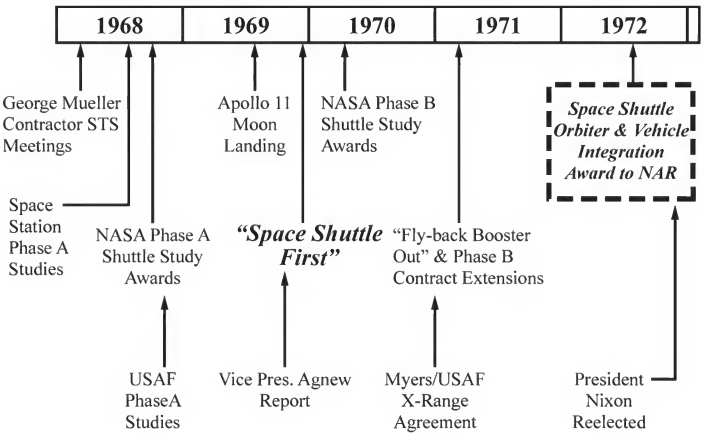
The stakes were HUGE! To win, the Space Division (SD) team had to be the best in the business and beat out corporate teams lead by Grumman, Lockheed and McDonnell-Douglas. At the same time, we realized that losing meant relegation to the minor leagues in the manned space hardware business.

The path to victory began more than four years earlier with just a handful of engineers in the Advanced Launch Systems project group. George Fraser and I were lead managers in the group. When the competing C/D proposal was put out for bid four years later, our team was over 900 strong. In the 40 years since the selection, thousands from our teams have played a pivotal role in the U.S. continuing as the leader in manned space flight.

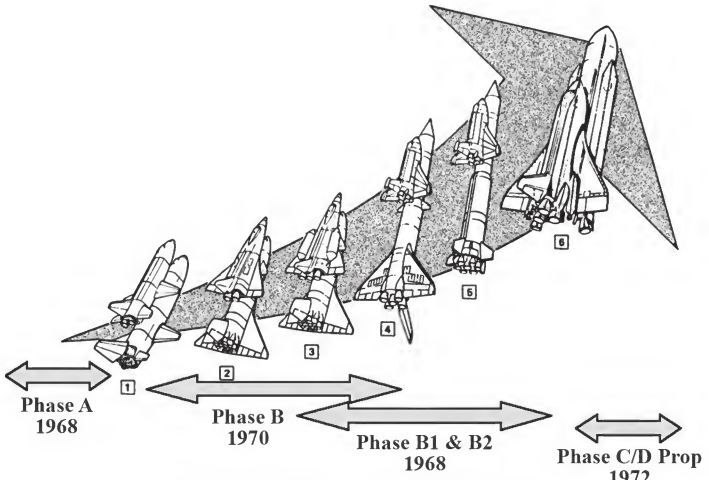
Questions of what our Nation should do after the moon landings, started soon after the Apollo contracts were awarded in 1961-1962. Ideas ranged from: a Lunar Base, a Large Earth Orbiting Space Station to Manned Mars Flyby missions. Advanced launch systems included Uprated Saturn V, Nuclear Rocket powered stages and Space Trucks (as Shuttle like concepts were dubbed). In early 1968, NASA Associate Administrator Dr. George Mueller got things off dead center, when he defined the need for reusable launch systems at lower cost.

With the Vietnam War cash drain and other economic realities towards the end of the 1960s, the options boiled down to Space Station verses Shuttle. If it were Shuttle, then what would it do, look like and who should be NASA's industrial partners?

Through the early study contracts, our Advanced Systems group pushed on, using company and small NASA R&D contract money. In the end, the accumulated pre-NASA C/D contract total funding was $3M. The North American Rockwell (NAR) investment was ten times that amount. But the returns to the ultimate winner were priceless. Through the early study contracts, we stayed on top of NASA's thinking and gained access to their senior executives, who would eventually be part of any Source Evaluation Board (SEB) that would recommend a contractor to the White House.



Major Events in the Space and Shuttle Programs



Contract Phases and Timing

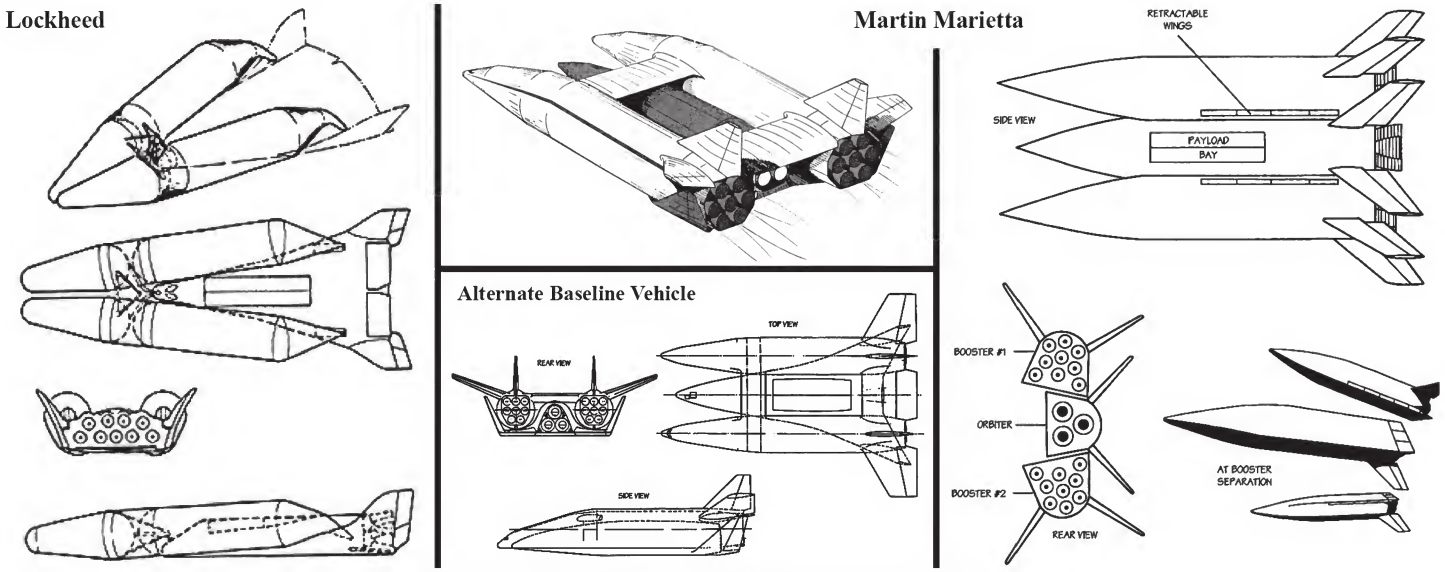
Phase A Shuttle Contracts

Buck Rogers would have gone for some competitors vehicle concepts. However, from 1962 until the first Apollo missions, our plate was full. Our program teams were immersed in technical, schedule and cost issues on the design and construction of the Apollo Command/Service Module (CSM) and Saturn S-II Second Stage. Consequently, for new system study contracts; we were, at times, excluded from the bidders list. With limited resources, we spent little time exploring radical configurations. Instead, we favored design concepts, which 'Kept it Simple.' As well, we knew that what looks flashy on a viewgraph, omits many untold complexities.

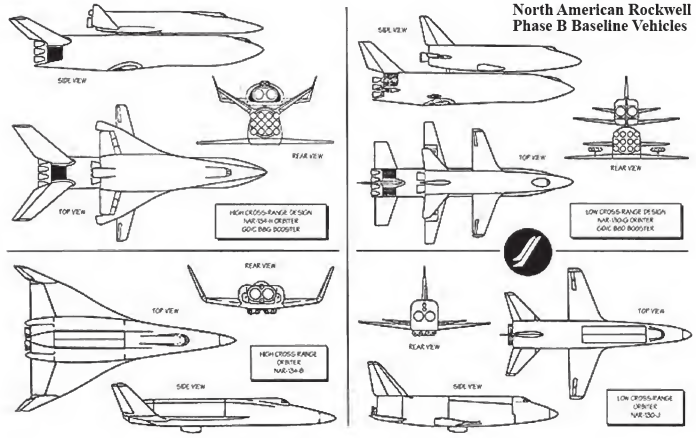
In 1968, we won Phase A systems studies from the USAF and NASA, each between $100K and $200K and 9 month duration. Around this time, the team moved to Seal Beach. These wins put SD on the first step to the ultimate prize. The studies were to assess future launch systems that greatly reduced the cost of delivering and returning earth orbiting payloads. This required economic comparisons; with contemporary expendable vehicles verses single stage to orbit plus 1-1/2 and 2 stage recoverable systems. Orbiter concepts ranged from simple lifting bodies to maneuverable space trucks. Payloads up to 50,000 lbs, 16 ft diameter x 50 ft long, were considered. From these parametric studies SD and others broadly concluded: 1) To accommodate, high weight payloads plus space station logistic support and crew rotation, two stage recoverable launch vehicles were superior, and 2) were doable with existing technologies.

On Towards Phase B

In the three months following the Apollo 11 crew's return, the pace and intensity of Shuttle related activities went into high gear. NASA and the White House soon announced that the Space Shuttle, rather than the Space Station, would be the Nation's next major manned space program. The common view was that both Shuttle stages would be reusable, fly-back vehicles. SD appointed Dale Myers as the Shuttle Program VP. From the Apollo CSM Program, he brought Charlie Feltz, Al Kehlet and several other respected veterans, and our Phase A study team was relocated back to Downey. It disappointed S-II Program Management who considered Shuttle key to their future.



Phase A—Lockheed 1½ & Martin 2 Stage Concepts



Our Phase B Proposal Configuration

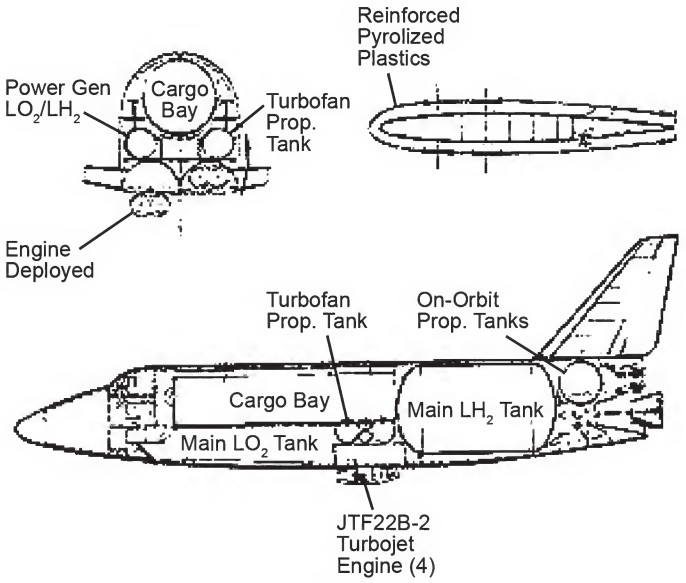
After three months, Dale Myers moved to become NASA Associate Administrator, Manned Space Flight. He left behind "big strategic foot prints" that contributed greatly to the ultimate win. They were: 1) SD would only bid for the Orbiter and target MSC as the center overseeing our contract, 2) find a well qualified partner with first stage ambitions. He initiated discussions with Boeing and General Dynamics. McDAC bid as the prime on both stages and was assigned to MSFC as NASA's overseer and 3) Dale Myers and Charlie Feltz recognized the difference between handling preliminary design concept studies and proposal bidding verses hardware programs. Wisely, they set about integrating the Apollo group and the 50 or so, Phase A team. They were systems trade off specialists, plus technical marketing managers with a proven track record in competitive proposals/bids.

NASA's Request For Phase B Bids Was Imminent

MSC named Bob Thomson as their Shuttle Program Manager. Dale Myers' successor, Buzz Hello, the NAR VP of Cape Canaveral Operations, came to Downey and quickly selected General Dynamics (GD) as the first stage partner. Boeing had a cockamamie idea about forming a joint company team to carry out the vehicle integration tasks and report to a combined MSFC and MSC team. To us, this was an idea thwart with conflict and confusion. The GD crew proved to be good and smart partners.

Using enhanced Phase A engineering data we selected two Shuttle vehicles baselines. One configuration used a delta-shaped wing, the other had slightly swept back wing, similar to the DC-9 airliner. USAF mission requirements favored the delta because; on return from space, it could reach airfields 1,500 miles from the orbital plain. For lower weight and design simplicity, MSC preferred the DC-9 plan form. Both stages used cryogenic oxygen and hydrogen propellant and the same basic rocket engines. Launch would be from Cape Canaveral and the spent first stage would fly 500-600 miles back to the launch site for reuse. Modified off-the-shelf jet engines would provide the power. Orbiters also used jets for ferrying plus post reentry flight and landing approach. Then, military satellite launches far outnumbered commercial and scientific utility. This and future Space Station logistics support drove orbiter cargo bay size and mission parameters.

The two fly-back configurations formed the basis of our Phase B 'get ready' activities. They included: further definition of the vehicles plus key subsystems, weight and performance parameters as well as, critical technologies and design



SD Baseline Straight Wing Orbiter

features. Rocket engine sizing and thermal protection systems (TPS) were especially important. In parallel, it facilitated melding the expanding SD team with GD counterparts. The proposal leadership team organized this data plus marketing intelligence to construct 'mock' NASA specifications and Request for Proposals (RFP) for use by the teams working on draft proposals. They were most important in sharpening our preparation skills. When NASA bid package arrived, it looked like we got much of it right.

Like all proposals with serious strategic implications, our Phase B preparations were full of vigorous debates, sweaty palms and late nights. Nevertheless, thanks to the earlier drills, we completed on time and felt good about the end product. Our technical response was compliant and we offered a rock solid, experienced team. There was Buzz Hello and Charlie Feltz in the 'top box,' Al Kehlet and George Fraser heading Engineering, plus additional new Apollo and Saturn S-II veterans respected at MSC. Based on NASA sourcing board evaluations, SD and McDAC were top and, happily, MSC was to manage our Phase B contract.

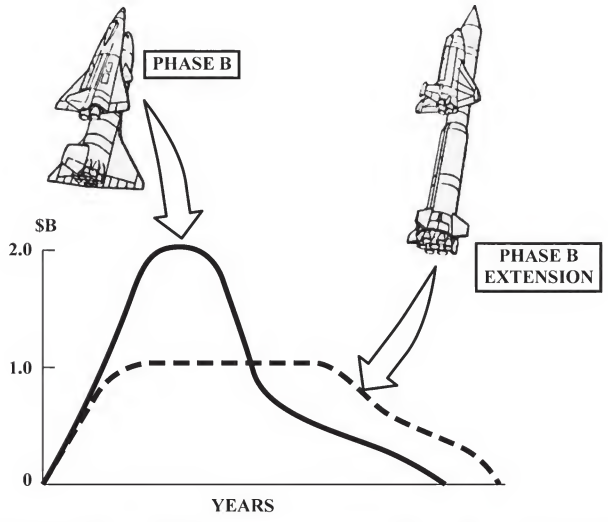
What we had not anticipated was that Grumman and Lockheed soon received parallel, narrower scope "consolation contracts". Respectively, they were: to explore alternate vehicle configurations, which used expendable first stages and TPS options for the baseline and other orbiter designs. Both were under the direction of the smart, strong willed Dr. Max Faget, head of MSC engineering. The contacts afforded them insight into critiques of our Phase B work, but reciprocity did not always apply equally.

A year into the Phase B, contrary our go-ahead optimism, it was clear several key matters were not going as expected. At the top of the list were the U.S. economy and NASA's future budget projections. The implications were that Space Station would likely come much later. Another factor affecting Shuttle missions were the great strides in electronics, leading to smaller and much longer-life satellites. The prior mission models of 50 launches annually now looked questionable.

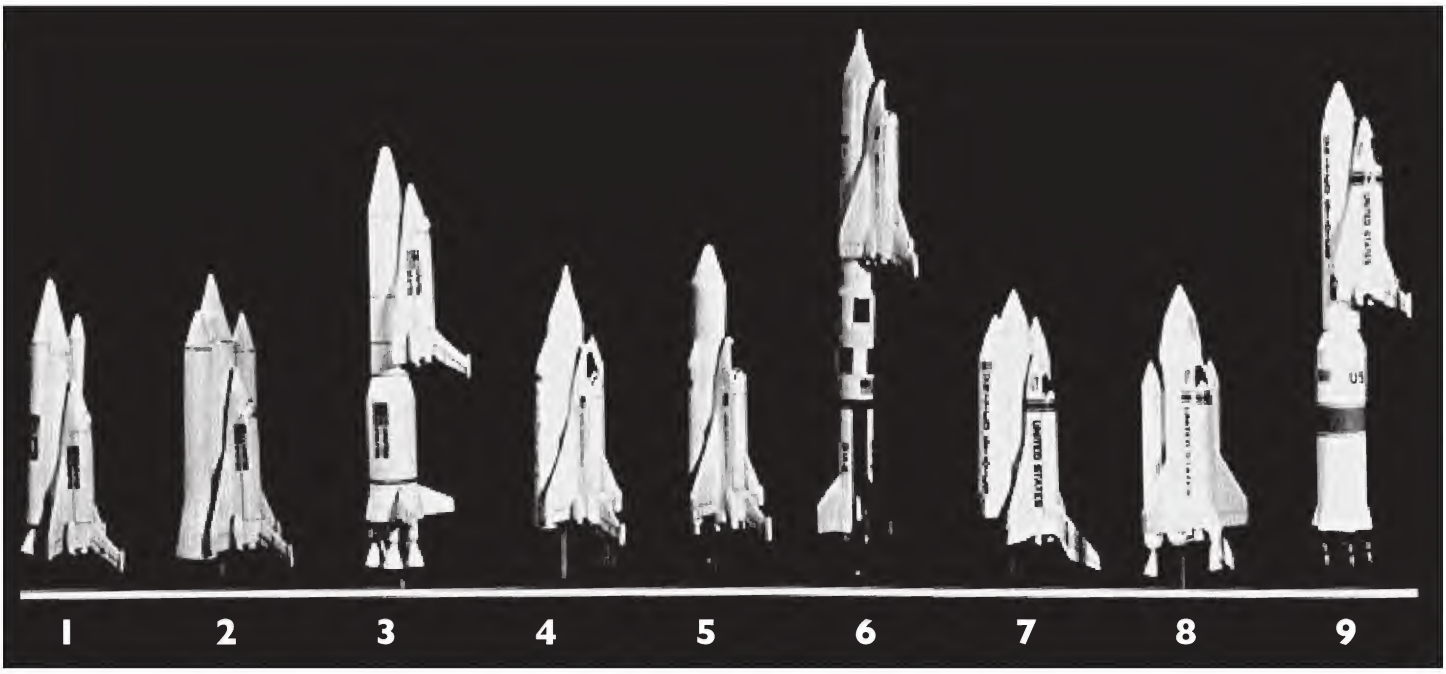
Phase B-1 And -2 Were Contract Extensions

In a nutshell, the basic purpose was to determine if Shuttle funding could be reduced and to find the most cost effective vehicle configurations. Focus was on current technology liquid and/or solid rocket expendable first stages. At the same time, mission flexibility and payload capabilities remained goals. This meant keeping similar Phase B Orbiter concepts and operating features. The core funding challenge and some of the vehicle combinations are illustrated.

Phase B elimination of fly back 1st stage options was tough on GD and other bidder partners. Thankfully, we had the S-II experts on hand, when our partner's company R&D funds withered. The extensions benefited SD because the orbiter systems requirements and features remained; making possible refinements of analysis leaving our team better prepared for the C/D competition. All Phase B-1 orbiters used the delta wing. This was part of an agreement reached by the Secretary of the Air Force and NASA's Dale Myers, when negotiating the military's backing for Shuttle.



B vs. B-1 Configuration Economics



Phase B-1 Configuration Concept Models

The End Game, Winning Phase C/D

The conservative assumptions used to steer all our strategies and action plans were: 1) the White House would approve the Shuttle award and 2) NASA's SEB would rank the bidders proposals and their report to President Nixon would say, *"The top two are well qualified for getting the job done"* thus providing the President an option.

Implicitly, our Technical and Management proposals had to rank best, at MSC, as well as, the majority of other branches. Later we learned, KSC favored Grumman as they proposed to conduct initial orbiter flight-testing at Cape Canaveral. All others planned to use Edwards Air Force Base. First and foremost, it meant our Phase B contract performance had to be superior. The likelihood of fierce political jockeying was inevitable, especially in a Presidential election year and with GDP having dropped from 6 to 3% between 1970 and 1973.

Buzz Hello made the first big tactical decision aimed at making SD the ultimate winner, before the Phase B proposal was finished. He rationalized, *"We must have a dedicated senior project group that is not encumbered by the day-to-day contract tasks. They will have a single focus—getting SD into the winner's circle."* The mandate read; 1) Develop strategies and plans, organize and manage preparation of the winning proposal, 2) expand intelligence gathering system, integrate and feed it into our bids, and 3) identify individuals likely to influence key decision makers and oversee implementation of plans to maximize their support for NAR.

The Proposal Management Group (PMG)

To get operations going, we first focused on a better understanding of what contemporary multi-billion dollar bid packages looked like. We learned a good deal from Los Angeles Division (LAD) management, about the strengths and weaknesses that lost them the USAF F-15 aircraft—McDAC won. In parallel, we organized links with Rocketdyne. They were competing with Pratt and Whitney plus Aerojet-General for the Shuttle's main engine. Engine selection, was expected several months before vehicle decision. We both had to tread carefully to ensure, in our zeal, no harm was done to the other's chances. Fortunately, we had worked with Rocketdyne's Sam Iacobellis for several years and arising issues were soon resolved.

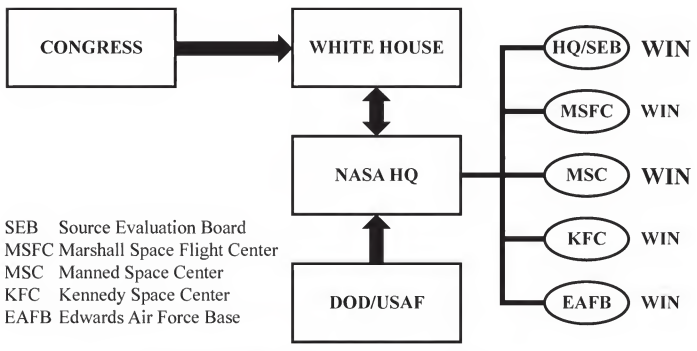
In order that sensitive tactics and information "stayed under the radar," some of the team resided in the Building 1 WWII vaults. This included the files and research needed for sensitive political meetings. In the year leading up to the C/D decision, we held meetings with important politicians and others who might influence Ministers and President Nixon. The premise was, *"If you tell them what to say and the reason why, then there's an excellent chance they will!"* The scores of contacts including the Governor of California, SD and suppliers' congressmen, plus VIPs behind the President's reelection. The PMG job was to recommend: who and what to brief-and who to do it: ranging from Al Rockwell, Bob Anderson to some Shuttle managers. We prebriefed each about the targets prior positions and NAR points to be made. Al Rockwell met with the President and Anderson too was a regular in D.C.

These anecdotes were typical: 1) the congressman for Palmdale CA area was Barry Goldwater, Jr. (son of Arizona's powerful senator). Lockheed assembled its L-1011 passenger jet in his district and they actively courted his Shuttle support. However, he switched to a big supporter for SD, after hearing plans to assemble the Orbiter in his district. Grumman went on his 'bad guy list' when their plan to exclude Edwards AFB was understood. 2) The UAW boss was Leonard Woodcock and most NAR hourly workers were members. IAM represented the McDAC St. Louis workers and Grumman had no unions. Woodcock actively lobbied on our behalf and suggested other movers and shakers we should brief.

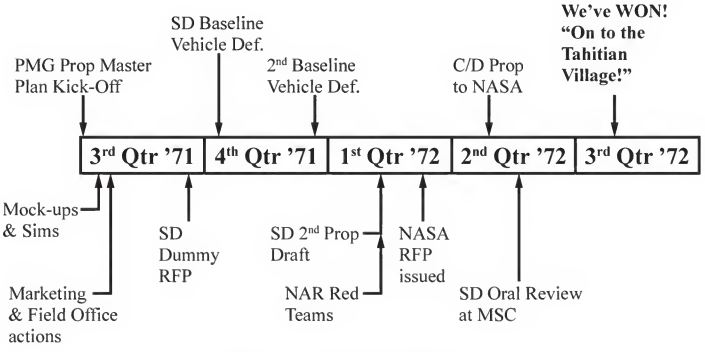
Each competitor maintained similar programs. We never saw much of McDAC. Our intelligence learned that they were too tied up in battles between their West Coast and St. Louis divisions. However, Grumman well deserved its reputation as politically aggressive. We saw this first-hand in the final weeks of the competition. Their 'full court press' involved New York Governor Nelson Rockefeller, and Senator James Buckley. Both met and for the record wrote letters to NASA boss, Dr. James Fletcher. In essence the message was, *"With the Orbiter contract award to Grumman, the company's overhead costs will be dramatically reduced. This will lower the cost of the Navy's new F-14 Tomcat aircraft."* The program was seriously overrun. Our counter was swift and effective. With a copy in hand, we suggested to MSC seniors, *"We guess your budget is about to be raided to bail-out the Navy."* They did not smile!

Phase C/D Proposal 'Get Ready' Started

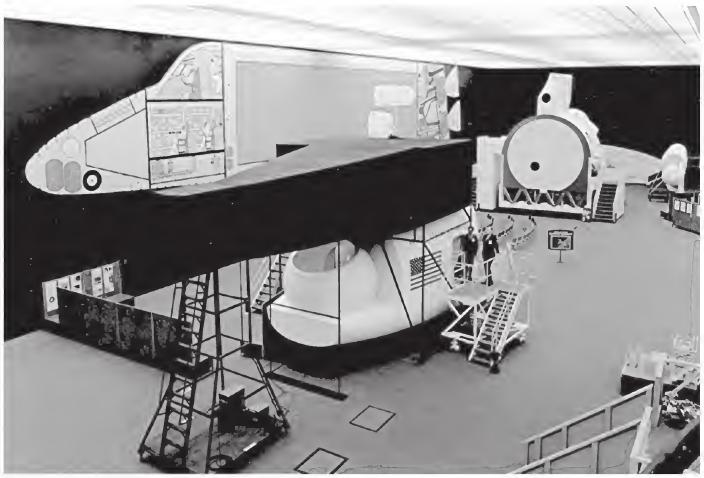
A year before the win and from Thanksgiving on, the pace was torrid. The end of 1971 was the earliest expected receipt of NASA's RFP. The actual NASA and SD events schedule are shown below. NAR funded full-scale mockups, high-speed wind tunnel tests and crew docking simulator paced. To work through two complete proposals drafts, including Red Team critiques, meant having our vehicle baselines, work statement and document guidelines ready in mid October. By this time, the NAR marketing reps in D.C., Huntsville AL, Cape Canaveral FL and Clearwater TX, took full direction from the



Tow Selling Jobs & Five Customers



Phase C/D Bid Timing



Downey—Partially complete Orbiter Crew section mock-up & simulator main engine bay at rear.

PMG. All were adept at getting helpful clues that we fitted into the Downey intelligence jigsaw puzzle. Many NASA middle managers liked to chat about work, over coffee or a beer. They had contractor preferences and so occasionally let items slip that helped our planning. Every two weeks we sent out a 'PMG 10 Most Wanted List' defining the hottest data needs.

We never used CIA type methods. However, a senior PMG marketing manager was approached, by a covert proposal data source at Grumman. Seemingly, he had access to the proposal team garbage (likely a Mafia contract). For a fee, he would provide copies of their drafts and more. Our SD manager strongly recommended we do it. When turned down he said, *"We were all naïve."* He was swiftly relieved of his job. Knowing we all aren't boy scouts, we tightened controls on SD trash and upped the frequency of electronic sweeps in key areas.

Relief Or Panic

Came March 17, 1972 when the Shuttle Phase C/D Request for Proposal arrived. The baseline was generally as expected. The scope of work clarified the responsibilities the winner would have in supporting NASA to manage the main and solid rocket engines plus propellant tank suppliers. The RFP had specific questions to be addressed, dealing with plans and approaches to difficult issues. The document guidelines had a few wrinkles, such as the broad content of the nine volumes. The maximum page count was 600 pages. (Not including four volumes on Pricing, the Contract and Work Breakdown.) There were also rough guidelines on page count per volume—to indicate importance?

All competing companies had routine exposure to Phase B monthly results. Each worked with similar systems designs and the same NASA senior overseers. Consequently, developing significant differentiations between competing orbiter designs was difficult. Thus, to score best; it was vital to document, that SD had the detailed capabilities to span the critical systems design and integration tasks. As well as the qualifications to build and support orbiter missions for decades.

Proposal themes were very carefully crafted and depicted in an oil painting that is replicated on the back page of this Bulletin. We used reproductions as cover art, on all volumes. Our challenge was to convincingly weave the themes throughout our response to the RFP without appearing to brag.

By Policy, NASA Sourcing Boards Must Rely Solely On RFP Responses

To evaluate the four, 600 page competing proposals, packed with highly technical material and plans, was a daunting task. For us, in preparing the proposals, the challenge was to provide high data density descriptions, drawings, figures, graphs and plans. They should draw the reviewer to the key issues; show that SD fully understood and have him approve of our planned approach/solution.

The myriad technologies, disciplines and processes involved in the Shuttle Program meant a large number of SD specialist had to provide specific contributions to each volume. Cohesively integrating these into our responses was tricky and complicated by having just eight weeks to respond. On top of that, documentations had to be clear and flawless to avoid any impression of our being sloppy about quality.

With the RFP arrival, we went into a 7-day, 12-hr mode. Saturday and Sunday there were free donuts and coffee. For the editors, typing pools and printing staff it was 24/7. We used same planning and team approach plus 'Story Boards' and 'Reading Room' review techniques, developed and honed in prior, get ready drills. This turned out to be very powerful. They ensured that Buzz Hello, Charlie Feltz and the PMG could, in the first three days, approve bullet point detailed outlines of each volume, its sections and, where critical, at each page level. Within a month, early-integrated Volumes and Chapters were in review. A few months later a NASA evaluator remarked that the illustrations SD used were excellent. They resulted from our planting our graphics artists in the midst of the engineers and others preparing write-ups. We also standardized the format for most schedules positioned throughout. When it was finished, I believe every team member felt *"That's our best shot and it's going to be very tough to beat."* We were also exhausted.

In a bit of one-upmanship we loaded the proposal boxes onto a commercial jet, the day before the Friday, May 12th dropdead date. For the first time in three months, we could now spend a weekend at home. The Monday morning meeting was a 'confessional.' There, with hindsight, we set about highlighting where we might have done better. This wasn't a sadistic ritual, it was getting ready for the NASA Oral Reviews and a final shot at improving our SEB points. To prepare, we generated over 50 questions, as well as, sections we would like to beef-up. The list grew as 'leaks from under the doors,' of NASA subboards came in from the field. For each question, we developed detailed responses and 10-15 minute briefings that we rehearsed and polished.

High-level politics can arise when huge contracts and careers are at stake. We had two real heart-stoppers. First, Bill Bergen, then President of NAR Aerospace Group, requested a first draft of the Management Proposal. The next day he was in Downey to meet with Joe Macnamara, Buzz Hello, Charlie Feltz, and the PMG. He told us, *"Your plan to create a dedicated Shuttle Program is wrong and a loser."* He directed, *"Change to a matrix management system."* Unlike Bob Anderson, Bill had given scant attention to Shuttle. Bob Anderson was traveling, but surreptitiously we got a message to him. The next day, Bill was back explaining we had completely misunderstood, what was (now) a 'suggestion.' Eyebrows were gently raised!

Next, our Shuttle manager in the D.C. office had first class intelligence sources although his boss wasn't in the loop. Nevertheless, ten days before the SEB selection, the boss called Al Rockwell and told him that Lockheed was first. He said they had bettered SD because of their commitment to subcontract 90 percent of the C/D program work to qualified suppliers. He recommended that SD send NASA an amended proposal, saying we would do the same.

An hour later, we were telling Bob Anderson this made no sense. The reasons: 1) From SD intelligence sources we were certain that Lockheed was fourth and we might be first, 2) What rationale would we possibly use to explain such a radical change, and 3) NASA procurement policies meant blanket refusal of amendments at this stage. Bob Anderson could not be in Pittsburgh so he arranged for us to meet there with the Chairman and the D.C. boss. Al Rockwell heard both sides and within minutes it was put to rest-make no changes!

The SD Oral Review At MSC

The SD Oral Review at MSC was held in the executive conference room at 2 p.m. to 6 p.m., Thursday, June 8th. Ten days prior, we received their list of questions, 13 SD specific and 7 common to all bidders. Anticipating this venue we made a movie of essentially, "What you missed by not coming to California" and used it in the Orals summary. There were 35 to 40 NASA executives and specialist in the room. Leading our team of 17 was Bob Anderson and Bill Bergen from Corporate, from SD it was SD President Joe Macnamara, and George Jeffs, his deputy, plus Buzz Hello and members of our team, needed to respond to specific questions.

The drills and rehearsals paid off and the four hours went smoothly. The presentations were on point and well done. The additional questions from the floor where handled effectively. All came across as regular, experienced professionals and on top of the issues. The NASA group was attentive and none were seen to nod-off. This was promising, given they had spent the morning listening to Lockheed.

Bob Anderson wrapped up the session. In five minutes, he hit all the key NAR highlights. His unscripted final words spoke volumes and resonated with everyone. They were, *"I'm a businessman."* Then he pointed to us, *"These men are engineers. With NAR; you get the best of both!"* This was especially poignant because less than a year earlier, the Government bailed out Lockheed from a pending bankruptcy and Grumman still had their big F-14 Tomcat overruns.

Back in the office on the next morning, Buzz Hello described to the managers, our good feelings about the day at MSC. But what to do now—Prepare for the Go-ahead? Yes, but it was tough to do for 47 days. In the PMG, we turned to the final phase: political contacts. At the same time, we became hyper-sensitive to field office tit-bits. Then there was a jump in Grumman share price during the last two weeks; meanwhile, NAR stock was flat, which had lots of us nervous.

The word came on July 26, 1972: NASA had awarded North American Rockwell the Shuttle Phase C/D program development contract bid worth up to $6.6 billion. The Tahitian Village in Downey became the epicenter for a jubilant crowd of the Space Division Downey and Seal Beach combined proposal teams ready to celebrate.

There was no holding back—we had to party!!!

Postscript: 1) Hundreds of dedicated NAR employees contributed their absolute best to make SD the winner. I am proud to have been one of them. I am especially proud to have been their colleague and friend, during those fierce battles with the giants of the aerospace industry; 2) From the earliest SD Shuttle work, George Fraser was a key contributor; he also provided background information for this summary.

About the Author: John Sandford joined the Space Division in 1962 and was the Director of the PMG and was the Shuttle Phase B & C/D proposals manager. Later, he was the CEO of several companies including; Gulfstream and Rolls-Royce Aerospace, US & UK. We thank him for this splendid historical effort.





SPACE SHUTTLE GOES TO NR

NA Rockwell Wins Big Space Job

New State Jobs

How We Lost Our Name and Our Heritage

by John R. Moore

Editor's Note: Over the past several years, we have been asked repeatedly how we lost our name – North American Aviation Inc. Rather than trying to define this bewildering case of guile and deceit ourselves, we rolled back the NAA Retirees Bulletins to the Summer 2002 Issue which contained the article by John Moore. We extracted the following segment of his remarkable report that covered this dastardly deed!

With the help of Morgan Stanley as NAA's investment banker, a deal was worked out for the Rockwell Standard merger, with NAA as the surviving corporation with Lee Atwood as the President and CEO, Al Rockwell as the Board Chairman and a new Board of Directors composed of a combination of all the directors from both premerger boards (12 from NAA and 12 from Rockwell Standard).

The merged company was called North American Rockwell (NAR) and I was given the job as President of the former seven NAA divisions and the Science Center involving 94,000 people. This was called the "Aerospace and Systems Group" (A&SG). Meanwhile, Rockwell had hired Bob Anderson from Chrysler and he became President of the former Rockwell Standard divisions and Al's plethora of new acquisitions and subsidiaries called the "Commercial Products Group" (CPG). Wally Booth was then brought in from the automobile industry as Chief Financial Officer. These two extremely competent executives and I were members of the Board of Directors and together with Atwood and Rockwell constituted the Executive Committee of the Board.

In September 1968, when the merger was a year old, Al Rockwell, who could be convincingly charming as any man alive, is reported to have approached Lee and said something like, "Our Board with 24 members is too large to be effective. We are one company now and it no longer is a board made up of NAA and Rockwell Standard members, so I recommend that we reduce the size of our Board by having all members over 70 years of age retire."

Even before the merger, it had been recommended by a management consultant that the NAA Board be "modernized" by replacing all those over 70. Lee rejected the recommendation, pointing out that such a move would remove some of the Board's best contributors. However, this time, under the spell of Al's charm and because the Board was cumbersome with 24 members, Lee agreed to Al's proposal. This meant that five of the former NAA Board members would retire and only one from the former Rockwell Standard Board, Al's father. Despite the fact that NAA was the surviving corporation, the new Board now had 18 members, 11 from Rockwell Standard and only 7 from the former NAA.

The majority of Rockwell Standard members on the Board used the loss of the F-15 proposal to remove Lee as CEO and to force him to retire. The A&SG was disbanded and its divisions were reassigned to report to Bob Anderson. I and all the top people whom I had brought to NAA, except Donn Williams, were forced and/or chose to leave the company. Donn was made President of Autonetics. It now became clear that the nominal acquisition of Rockwell Standard by NAA had been a "Trojan Horse".

Thus, the book was closed on America's premier high technology aviation and aerospace company with the most respected name of North American Aviation, Inc. becoming a footnote on the pages of history.

We know that you are no longer with us, John, but thank you for being our friend and for this mind-boggling report. Only you could have told it as it was!

NASA Response To Apollo 1 Fire Report

by Gary Johnson, NASA

Editor's Note: An NAA reader sent a copy of the NAA Retirees Bulletin Apollo 1 Fire Investigation to NASA Retiree Gary Johnson. He was responsible for the Apollo Electrical Systems. Here are his comments of what the investigation uncovered.

It was on a Friday about 6 p.m., most of the Flight Control Team had gone home. Mort Silver, NAA ECS Flight Controller, and I were the only ones in the SSR in Houston. At the time of the fire, I was on the EPS console and Mort was on the ECS console. Reviewing the data revealed an electrical short had occurred on Main Bus A & B. I spent the next week going through all the electrical schematics to identify all Main Bus A & B dioded loads.

My Section Head, Bob Munford, then requested that I go to the Cape and be responsible for going through all the electrical wiring for the investigation team. I was the only NASA engineer allowed in the CM to go through the wiring. My notebooks were kept locked up when not in use.

The final conclusion was that the most likely cause was the electrical short of the diode from Main Bus A & B ECS instrumentation power wire, which was on the left side near the floor routed over the O_2 lines going under the ECS access door. Photos showed this wire to be initially wrapped in a Teflon overwrap to protect the wire. Subsequent closeout photos showed the protective wrap had slipped down and was no longer protecting the wire. This location was such that if you put your foot down in order to turn around and reach the comm cable, called the Cobra Cable, you would step right on the wire.

The data indicated that Gus Grissom was in the process of switching this cable when the fire occurred. The Teflon insulation is a soft material and subject to cold flow. The insulation could have been damaged by the access door and the wire with the damaged insulation flexed up and shorted when Gus stepped down or stepping on the wire, smashed it against the metal tubing, which I think is more likely. For the report, it talks about possible damage from the ECS access door and any mention of the possibility of Gus stepping on an unprotected wire was not to be included in the report.

Salute to North American Aviation at the Western Museum of Flight

On Saturday, October 9th, the Western Museum of Flight in Torrance, California held a Salute to North American Aviation Day. Over 1,500 NAA retirees and their families came. Yes, there were plenty of sore knees, wrinkled faces and squinting eyes, but there were more hearts filled with pride and spirit. After all, this was family—North American Aviation family. In a hangar with its doors wide open, they gathered. At the head table sat the "flying aces" of days gone by, the P-51 fighter pilots and NAA test pilots. The room filled quickly with the retirees and their families with everyone looking for a familiar face. Finally, the Grand Marshal, Bob Hoover, arrived. Moving a little slower but still tall and patrician in appearance, he was quickly surrounded by admirers and autograph seekers. Unseen, but somewhere in the shadows, enjoying this festive moment, there stood Dutch, Lee, Ralph, Edgar, Stormy and Charlie. So it was, a day to be cherished, a day to be remembered. God bless us all!

Editor's Note: We wish to extend our appreciation to Museum Director Cynthia Macha, Gar Travis and Lowell Ford for the many splendid photos they provided for this article. We regret that there was not enough space to accommodate them all.



Gar Travis

Grand Marshal Bob Hoover



Lowell Ford

Commander "Ace in a Day" Bill Hardy and Earl Theaker



Ed Rusinek

"Bernie" Fricke and Jean Theaker



Lowell Ford



Ed Rusinek

Ed Kaston



Gar Travis



Gar Travis

Dale Myers



Lowell Ford

Lowell Ford


Museum Director Cynthia Macha presents Grand Marshal Bob Hoover a new straw hat

Gar Travis


Gar Travis


Gar Travis


Fighter Ace and Test Pilot Jim Brooks

Gar Travis


Stefani Operacz

Lowell Ford


Lowell Ford


Joann and Ed "Moke" Mokslaveskas

Ed Rusinek


Gar Travis


Pete Colapietro, Joe Onesty, Keith Taylor, and Ed Rusinek

Ed Rusinek


Gar Travis

Designing the XB-70 Fuel System

by Cleve Kimmel



U.S. Air Force photo

XB-70 AV #1 climbs after takeoff on its maiden flight September 21, 1964.

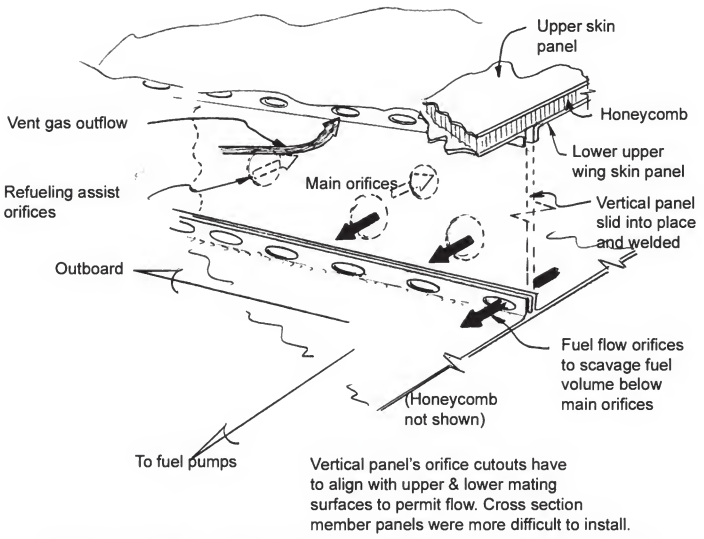
The North American Aviation XB-70 first flight was on September 21, 1964 with Al White and Joe Cotton at the controls. The last flight was on February 4, 1969, with Fitzhugh Fulton and Emil Sturnthal at the controls. Its highest test altitude was 74,000 ft with Al White and Van Shepard at the controls. The two aircraft flew more than 252 hours, with 1 hour and 48 minutes over Mach 3. A/V #1 was not designed to attain Mach 3. These test aircraft had one large bomb bay used for instrumentation, and it was packed full. The production version was designed to have two bomb bays.

No other aircraft in the world at this time had ever been constructed to match the staggering performance of the all white XB-70, named the *Valkyrie*. The goal of this aircraft was to fly so fast and so high that enemy aircraft or missile interception was impossible, and that nuclear strikes on the Soviet Union could be threatened and ordered to be delivered without risk. It was designed to cruise for long distances at Mach 3 and at extreme altitudes. Power was provided by six General Electric YN93-GE-3 after-burning turbojets. Its normal cruise altitude was designed to be 80,000 ft but it could fly substantially higher. It was designed to carry 50,000 pounds of bombs and had a range of 7,600 miles without refueling. It weighed 551,150 pounds at takeoff and was 196 ft long, had a wingspan of 105 ft and a height of 30 ft. The wing span area was 6,297 sq ft. At takeoff, it appeared to be angled at more than 30° degrees, but was actually only about 10°. It gave the appearance of a huge goose taking off from a lake, very majestic. Since it was very large, its flight appeared to be going in slow motion.

The original intent of the Air Force was to replace the aging B-52 bomber fleet with this aircraft and 200 were planned for the initial release, plus 150 reconnaissance versions. Four members were to crew the production versions: two for prototypes XB-70 A/V #1 and #2, and four for A/V #3. However, only two prototypes were actually completed. When the proposal design was released to the shop floor for design implementation, most of us were quite taken aback by its unglamorous appearance. As I recall, it was rather box-shaped. From that moment until design-freeze there were about 100 aerodynamic shape changes to the vehicle. Each change meant that some or all of the supporting groups had to redo their design analysis; thus "chewing up the clock". As precious months went by, the drafting work had barely started. For me, I was faced with redoing the fuel flow calculations, line sizes and routing changes needed to integrate them with the other subsystems. My efforts were basically confined to the main engine feed subsystem, internal fuel tank transfer subsystem, and a nitrogen inerting subsystem that I later invented to prevent auto ignition of the fuel vapors. When the Structures Group established the wing configuration, they fastened the upper and lower panels together with multiple vertical panels spread throughout each tank, thus resembling "egg crates". Tank Number 6L and 6R each had 60 separate fuel compartments, the other tanks had about half as many. Getting fuel into and out of these small segments proved to be more than a simple analysis nightmare, and for about three years I was busy calculating fuel flowrates, using up precious computer time with abandon. Design of the multi-compartmented fuel tanks was further compounded by the need to design for the recently established high flow refueling systems planned for use with this and other military aircraft. Accordingly, the venting holes at the panels' upper areas almost consumed all of the structural integrity. All concepts required tough choices in designs.

The design effort began as a highly classified SECRET project about the same time that the secret YF-12 (later called SR-71) aircraft was being developed by Lockheed. Both were scheduled to fly over Mach 3. I was hustled over to the B-70 production program from the X-15, and was assigned to design the engine feed and fuel transfer systems. The engines were located about 80 ft behind where the main fuel tank was to be located, and the fuel had to be delivered there through piping that was almost 120 ft in length, and within very tight engine inlet pressure margins. Also, North American Aviation (NAA) designed most aircraft using rigid wing concepts. In this, the metal itself did very little flexing or bending, and was probably what gave these aircraft types such air superiority over others in WWII. It also meant that getting all of the fuel out of the wing tanks in this large aircraft would be a difficult task; one, which would cause much heartaches and pain for me and others as the years went by. I had worked on the fuel system proposal earlier, and it wasn't a shock to find myself transferred. What I didn't realize at the time was that I would be spending about 80 hours a week performing the design calculations needed to keep pace with all of the other departments' needs. All work was initially calculated by hand or by using a 12" slide rule. As with the X-15, the new fuels had characteristics that had not been developed or tested yet, and it was up to me to establish their chemical boundary limit parameters, and interface them with the fuel system design and flight regimes to be imposed upon the aircraft. Being a chemist, and assigned to the Powerplant & Propulsion Group, it was my mission to identify these parameters as needed.

As mentioned earlier, the wing tanks carried about half of the fuel needed for the flight, and each of these tanks was structurally cut up into many small sections, much like "enclosed orange crate sections". The fuel was transferred to the engine feed internal "sump" tank. The structural engineers preferred that these wing tank sections be totally solid, without any holes in them, so I was not very popular when they were informed that these panels were going to be cut full of holes. To place any cutout in a panel required considerable flow analysis by me, and even more calculations by the Structures Group. To place about a hundred holes in each separate vertical panel was almost inconceivable to them! My job was to get fuel into and out of the tanks within prescribed physical limits demanded by the flight profiles without over or under-pressurizing the tanks. Tanks Number 6L and 6R had 60 of these closed compartments; others contained fewer compartments. During cruise the tanks were elevated about 1/2° above level. So there was very little gravity force to assure that they would empty by drainage, without cutting many slots into the structural support frames attached the wing skin panels and the vertical structural interspaced panels. This is where the "fun" began. Until this time, no person had ever determined the liquid flowrate through a circular orifice (hole) once the downstream side had become half submerged. I was totally unaware of this paradox. The calculations became a nightmare of analysis. Fortunately, the IBM 6090 computer systems had just been invented, and this tool was used to perform the calculations. It would have been impossible to perform the chore manually. This huge-physical computer had the very little operating memory, and it took a lot of time to complete the calculations. It was housed in an area of about 2,000 sq ft of space. It had eight tape drives and one



Typical Wing Tank Section Sketch for Fuel Transfer (approximately 10,000 orifaces in total)

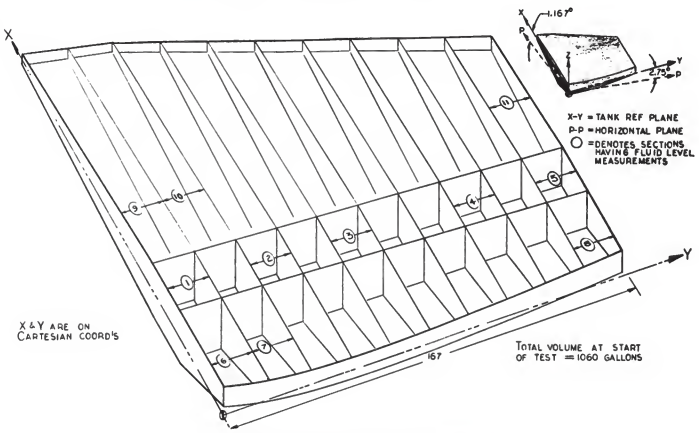
hard disc drive (about 20 inches in diameter). Calculations took more than ten hours for portions of each design configuration and flight regime that was tested. More computer time was allotted to me than any other person, averaging 600 hours per month. Computer personnel liked the slack time when the fuel system calculations were running (as they took between eight to twelve hours to complete), all others hated me. This computer was linked to the ones in Canoga Park and Autonetics so that the math formula for fluid flow could be calculated. It was the largest computer program generated at that time.

The normal method of fuel system design at NAA, prior to my tenure, was to construct a full-scale fuel system simulator, and through a long series of trial-and-error tests, the eventual placement of the components for fuel to flow through the tanks and tubing could be established. These tests typically for a small fighter plane took over a year. I couldn't even begin to imagine how to proceed using such a scheme with an aircraft as large and complex as the XB-70. So, I convinced management that the calculations needed to do could be accomplished without elaborate testing schemes; thereby, conserving funding dollars. I made my first calculation, and had a simple tankage system constructed to support this test and the other functions that had to be developed for the fuel system. The orifices were first incorporated into a small system with ten compartments and tested. This appeared to be okay, and deceived me about the difficult reality that I would be faced. The first full-scale real test was of such significance to the company that they had invited the Air Force Command Staff and Pentagon officials who were monitoring the operations (more than 30 people) to witness it. I could not ever have been more embarrassed. After several hours, the tanks were still over half full, and fuel was dribbling out in little streams; obviously, the system couldn't deliver the proper amount of fuel. The dignitaries had long gone, and I was left with a mess to correct. My first thought was that I would be terminated immediately. However, this didn't happen, management said, *"You designed it, get it fixed!"* Then to my horror, I discovered the fact that no one had ever determined the flowrate of liquid through partially submerged orifices! I was in error assuming so, and my analytical approach was in error. Other mathematicians I consulted stated that it

couldn't be solved! The problem was that all known methods of calculations simply couldn't converge upon a solution. And me with a degree in math! It took six new physical theories of how liquids behaved when passing through an orifice before the final math formula could be developed.

When it came time to inspect these thousands of orifices that were incorporated into the fuel tanks, I sent a memo to my boss describing the inspection details. However, he insisted that I go to Palmdale and perform the inspection myself. I wasn't too keen about that, since it was a difficult task to crawl about inside of these wing tanks, and be there before the panel that needed to be welded/brazed in place was inspected prior to being closed off.

After my first trip (arriving after a few panels had been welded in place), I wrote a blistering memo to the Project General Manager who sent me there, defining the complete disregard for all of the written mandates I had submitted earlier to him about the installation. The panels and the tank floor and top structures were totally misaligned and had to either be cut apart and re-assembled or additional holes re-cut into the completed frame assemblies as there was no passage for the gases and fuel to pass through. Either method for repair was virtually impossible! I also suggested that the production halt until the manufacturing crew knew what had to be accomplished on the panel alignment. What a disaster! I returned the next day to continue inspection, and when I walked in, all of the assemblers stopped working and watched me as I approached the aircraft. In the middle of the shop area was a HUGE man, evidently waiting for me. He must have weighed more than 250 pounds, and he looked like a prizefighter and wrestler rolled into one. There wasn't an ounce of fat on him anywhere! *"Are you the son-of-a-bitch who wrote this memo?"* I started to shake and could hardly speak; I was so taken by surprise. *"Yes, I am"*, I finally stated. He then lit into me verbally about the bashing he took from his boss concerning the "sloppy" job of construction I had reported, and that I should have presented my concern to him first, not to the General Manager (our boss)! For over an hour the verbal lashing continued with all the shop personnel hanging onto every word. I finally found my courage and countermanded his actions, stood my ground, and we completed the discussions about aircraft inspections and construction in an amiable fashion. We agreed to a procedure whereby I could work with the manufacturing teams such that they would be able to install the panels without blocking the holes. This worked perfectly, and not one other panel had to be corrected. I learned a very valuable lesson in chain-of-command that I should have realized earlier.



Multiple Baffled Tank

The aircraft was planned to use JP-6 and a highly secret "high-energy" type of boron-based fuel that provided a considerable gain in the flight performance and range. It, unfortunately, had a serious side affect. It could not be allowed to emit vapors into the atmosphere. Thus, we designed a pressurized fuel system, along with an unpressurized backup system for emergency operations only. This meant special valving and operational techniques unlike the one used on any other fighter or bomber, but similar in design to that created for the X-15. Additionally, the high speed at low altitudes would cause the fuels to be heated above their auto-ignition thermal ranges. This imposed a vital need for a system that would prevent the fuel vapors from exploding. In the proposal submitted to the Air Force, this was not considered; but later analysis confirmed a definite need for such a system. It was at this time that I invented the "Nitrogen Fuel Tank Inerting System". Integration of this system with a pressurized fuel system proved to be very interesting. Proposals were submitted from vendors that defined their in-depth analysis needed to meet the mission profiles defined in the RFQ, and eight firms (seven in America and one in England) were selected to compete from more than 30 who expressed an interest. Five of these companies hired university science and math professors to assist in the complex mathematics and engineering required to implement their particular system design. The Inerting and Pressurization system removed some dissolved oxygen from the fuel as well as maintaining the gas space over the fuel below the ignition limits as the temperatures approached auto-ignition conditions. Management agreed on the need for added protection and backed the designs without question. To accommodate an improved measure of safety, George Patterson invented and patented a scrubbing system to remove dissolved oxygen from the fuel during the refueling process. He and I designed a test site to determine the flammability limits for the new fuel types, and the existing ones that had very little data on them. The test tankage consisted of a 100-gallon tank inter-connected to a 500-gallon tank and a venting system that allowed us to duplicate the aircraft's severest flight profiles. During the testing we had one explosion-thus confirming that auto-ignition was a real possibility. Parker-Hannifin, one of the bidders was the eventual winner of the competition for inerting the XB-70. It performed flawlessly throughout its life span, so much so that I completely forgot about it when monitoring the XB-70's flight at Edwards AFB.

With the bulk of the component systems out of the way, testing and final development was underway. This is where the fun began, as virtually all concepts were new to the program.

Most of the technical staff members (we used to be called engineers, but in lieu of pay raise NAA's new management team created a series of fancy staff titles) were worked pretty hard.

The B-70 aircraft had to be capable of short-term zero-g and negative-g flights. This meant that the fuel could be positioned anywhere in the tanks during these intervals, and without proper controls the engine could flame out. It could accelerate or decelerate at steep angle of attacks and under really heavy g-loads, thus compounding the fuel force pressure variance that could be imposed at the engine inlets. Also, with the engines located more than 80 ft to the rear of where the fuel supply pumps were located, coupled with the aircraft flight attitudes

and g-loads, it was readily possible to over or under-pressurize the engine inlets without an innovative pressure control subsystem. I determined that the best overall solution would be to have the engine fuel pumps operate from an adaptive hydraulic pressure system, sensing the actual pressure at the engine inlets, and not a slow response electrical system that was the norm for the day. The hydraulic system operated at 6,000 psi. Other military aircraft hydraulic systems at the time operated at 2,000 or 4,000 psi. All new technology was required. The fuel flow to the engines was routed through a six-inch diameter tube, which was connected to three fuel pumps within a confined section of the main fuel tank near the center of the aircraft. Two pumps were mounted right side up, one upside down, and at the top of the "sump" tank designed to sustain all g-load maneuvers that could be imposed upon the aircraft. All transfer and engine boost pumps were designed to operate continuously without fuel passing through them and at temperatures up to 600°F. The system was also equipped with "suction feed", should all three pumps fail. When the first aircraft was undergoing flight tests, it was normal to go to military power (110% of the engines rated maximum force) prior to release of the brakes. After brake release, the hydraulic pressures consistently dropped to below 2,000 psi, then recovered. This phenomenon continued for several months, with only the hydraulic engineers aware of the problem. The engineers had assumed that the flight controls were requiring more time to become dynamically stable than predicted. So they altered the flight takeoff procedure to 100% power until the aircraft was moving, and then switched to 110% power prior to liftoff. (Unless I got the concept backwards!) This worked and the pressures held steady, and the problem was all but forgotten.

After one year of flight-testing on A/V #1, the maintenance crew at Edwards opened the main fuel tank for routine inspection and found that the assemblers had failed to connect the engine feed line onto the pumping manifold in the sump tank. There was a six-inch gap between the boost pump manifold and the main engine feed line! When called to produce the required pressure at the engine inlet the adaptive pumps took up virtually all of the available hydraulic pressure and maintained the engine feed system within its prescribed narrow pressure band by throwing the fuel across the opening, and into the rest of the line; thus, there appeared to be no abnormality with the fuel system. They later contacted me about the system, and were stunned to find out that the safety backup criteria I had built into the pump design virtually assured positive engine feed regardless of the other aircraft system needs. Keeping the engines going was one of the system's prime directives given to me.

The normal cruise flight "angle-of-attack" profile for the aircraft was very shallow, which meant that there were virtually no low spots in the wing tanks from which fuel could be puddled, and location of the fuel transfer pumps was very difficult. The fuel transfer and scavenge pumps had to be able to literally "suck" the fuel up from the flat tank floor, and the structure holding the tanks together had to allow the fuel to flow at a rate sufficient to meet engine demand. It had to do this while the fuel was at its boiling point. We allowed for 1/2 inch of fuel above the lip of the pumps entrance to be lost (3/4 inch total height). During testing, the pumps were so efficient that they re-condensed the fuel rather than cavitating, and they could draw fuel vapor up into their impellers while placed one inch over the surface of the boiling JP-6 fuel, thus draining the tanks completely. Additional flight range was obtained. There were no electrical connections or wiring permitted to be placed within the fuel tanks (to the best of my knowledge). During initial flight testing, the fuel volume changes recorded by the gauging system, and the volume consumed agreed with each other.

During the first Mach 2+ test, I was in the NASA control room at Edwards AFB and the pilot radioed that he had flamed out. We immediately lost contact with him, but could follow the aircraft on radar as it descended towards earth. We lost its trail on radar when it dipped below a hill somewhere in North Dakota as I recall. All of us feared the worst. After about three more minutes we picked up its transponder signal and regained voice control with the pilot. He was able to restart one engine, then four more, and was then able to regain electrical power. He was returning home. Inspection revealed that the outer skin panels, inside of the enormous air intake ducts, which incidentally had a huge radar signature, had torn loose from the honeycomb interior and passed through the engines, causing them to flame out. With six engines not running, and the air starter attached to engine No. 1, it had to be started first in order to get hydraulic power available for starting the others. All APU power was lost in the mishap. Inspection of the engines showed that many of the turbine blades were missing, and there was no explanation as to how the No. 1 engine ran, let alone even rotate to get air started! Fate must have intervened. Corrections to the panel design were incorporated, and no further mishaps occurred.

One of the last steps in the aircraft design was to verify that there were no potential system malfunctions that might cause the aircraft to be damaged or lost. This was called Safety Analysis. Many engineers were working on each of their own subsystems, but the overall integration of each of these subsystems had to be accomplished. They stuck me with that job. I created a file of over 20 ft of ledger books describing multiple scenarios of failures and the corresponding reactions or controls needed to prevent mishap. I became very familiar with all of the systems needless to say. The only potential for serious damage to the aircraft due to a nonfunctional part was the hilarious consideration that should the steering wheel decal insert (an emblem that resembles a large horn button in a car's steering wheel) come loose at touchdown and roll under the brake foot pads. After these final calculations and myriads of others for the fuel system design, I was placed back onto the X-15 project to assist in the redesign of that aircraft to reach Mach 8. The second XB-70 was in construction. The manufacturing group had designed and perfected a metal cutting technique using lasers. It could make straight cuts through inconel steel panels some 26 inches apart. A very heavy and precise cutting tool was developed that would allow the laser to make a linear cut about 80 ft in length. The curvature angles of the wing attachment surfaces presented some concerns to the engineering groups, and they refused to sign off on the cutting procedure. The A/V #1 wing was assembled by hand-fitting the contours of the wing to the fuselage with thousands of assemblers. It was claimed that the curvature would prevent a straight cut, regardless of what the manufacturing tooling engineers claimed. A very tense political battle was created, and vice-presidents of both

departments were pitted against each other for several weeks. Over a holiday weekend, on a Sunday, the manufacturing team made the cut, unauthorized by engineering. The tool failed, and the wing and aircraft attachment joints were destroyed! About 4,000 engineers went to work on a 24-hour, seven-day week to develop a corrective patch. This ended up with a new airflow design to the wing by creating a "gull" like attachment panel between the two surfaces. It also added more wing-tank fuel compartments and volume. I was called back to establish the fuel flow areas and locations in the added panels. The aerodynamic characteristics of the aircraft were actually improved by the fix, but it was also very difficult to fabricate. Thousands more leak-potential joints were created, and new safety and failure analyses had to be performed.

On June 8, 1966, five different aircraft, each powered by General Electric engines, were flying in a tight formation alongside XB-70 A/V #2, Flight #95, for some publicity shots. A NASA F-104, piloted by veteran pilot Joe Walker, strayed a little too close to the XB-70 and its massive vortex field (undetectable at that time). The vortex generated by the down-turned wingtips sucked the small jet aircraft into it. The little F-104 was tossed across the XB-70's expansive wing, smashed into a tail fin and then exploded. The XB-70 flew on for several seconds before it started to tumble to the Mojave Desert floor several miles below. The aircraft impacted and virtually disintegrated, but there was neither explosion nor fire since its fuel system was protected by the liquid nitrogen inerting system. Al White, the pilot, ejected satisfactorily, but the co-pilot couldn't get his arm into the escape capsule, thus preventing its release!

Secretary of the Air Force, Harold Brown, announced shortly afterwards that the written reprimands would be given to all parties involved with the act, and that Col. Albert W. Cate, was relieved of his command duties as Deputy Director for the XB-70, and re-assigned to the contract management division at Wright-Patterson AFB. None of persons who received reprimands were available for comment!

The aircraft required a redesign of the ejection system, and systems of pulleys were created that used a M4 cartridge to generate the gasses for the force needed to pull everything into place. These pulleys and wires were attached to the legs, feet and elbows of the pilot's suit and shoes, tucking him into position so that his body could clear the escape capsule hatches upon closing. The system operated so fast, that the test subject's bodies were sitting loose one second, and within a few milliseconds later, they were all tucked into position faster than the eye can see. It was very amusing to the test subjects to see their feet disappear.

Shortly thereafter the chaos created over the loss of this aircraft due to granting publicity favors, plus the fact that the USSR had recently developed high altitude intercept rockets that had the potential of seeking the XB-70 in flight, probably was the catalyst that caused the Air Force to terminate the program. A/V #1 is now permanently displayed at the National Museum of the United States Air Force at Wright-Patterson AFB in Dayton, Ohio. It is still a spectacular sight.

The comments related by the test pilots flying the Valkyrie in 1967 are interesting:

Col. Joe Cotton (USAF) stated, *"I compare it to taking a Greyhound Bus 200 miles per hour around the track at Indianapolis."* He flew 19 missions as pilot; 43 as co-pilot.

Van Shepard (NAA test pilot) stated, *"About the same as when I went supersonic the first time and Mach 2 the second time. There's a sense of excitement to it the first time you do this in a test airplane, and there's some adrenalin flowing."* He flew it 23 times as pilot, 23 as co-pilot.

Fitzhugh Fulton, Jr. (USAF & NASA) said, *"All I'll say it's interesting. I've only flown one flight at Mach 3, and the airplane went extremely well. I'd say it was a routine flight. Maybe by some people's standards it wouldn't be, but to us it was routine in that it went as planned."* He flew it 31 times as pilot, 32 as co-pilot.

The other pilots and number of flights made were:

Al White (NAA) 49 as pilot, 18 as co-pilot.
Carl Cross (USAF) 1 as co-pilot
Don Mallick (NASA) 4 as pilot, 5 as co-pilot
Emil Sturnthal (USAF) 3 as pilot, 7 as co-pilot.

This was an end to a terrific era, and I for one was very saddened to see it vanish before my eyes.

About the Author: After receiving a degree in Organic Chemistry from the University of Montana, Cleve enlisted into the Army and served for 3-1/2 years during the Korean War. Gifted with the ability to read and comprehend technical reports at 9,000 words per minute, he joined NAA in 1956 and was assigned to the Powerplant, Propulsion & Systems Group at LAD. He worked on various fuel and propulsion systems designs including the F-100, F-107, B-70, Navaho, Rocket Test Sled, Lunar Lander Simulator, Heavy Body Lift Buoyancy Transport, SST, and the X-15. He took early retirement at 55 and currently resides with his charming wife, Adonna, in Billings, MT.



Contrails From The Past

by Ed Rusinek

Dear Ed,

Reading the article about the Apollo 1 Fire Investigation reminded me about some clean-up engineering I was doing at Downey late in the program. The task involved a Service Module located on the factory floor. I noticed that there was a lot of wiring along the upper edge which appeared black and very badly burned. Upon return to my department, I mentioned the burned wire to my lead engineer. He informed me that the reason for the burned wire was because that was the Service Module on which the Apollo Command Module was mounted when the fire killed the three astronauts. I was shocked at this news and asked him why this Service Module was still in use. He responded that it was no longer a flight vehicle but served as a mockup and was very cost effective. I responded that using it as a mockup did not seem a proper tribute to the three dead men.

—Douglas Alkire, Monterey Park, CA

Ed's Ans.: I must say, Doug, no matter what story we throw at you, you always come up with a related vignette! Keep it up!

Dear Ed,

Again, congratulations for the great job in putting together a wonderful news and history document. The latest Bulletins are of particular interest to me since I started in Downey in May 1962 and have both happy and sad memories of our successes and tragedies. Larry Korb did an excellent job on the history of the Apollo program and how NAA took the blame for the tragic fire.

I was a Manufacturing Project Coordinator on CSM-009 and, in 1975, transferred to the Material Department on the Shuttle. We made a great product and it performed well.

—Dick Westphal, Oro Valley, AZ

Ed's Ans.: As Larry pointed out in his article; once the government gets into engineering issues, they become political "wishues" leading to disaster! Thank you for the generous check! I think you folks like our efforts!

Dear Ed,

I enjoy every issue of the NAA Retirees Bulletin. I have enclosed a check for the USAFA Scholarship Fund.

—Stanley Thimakis, Tustin, CA

Ed's Ans.: Wow! Your donation is huge and most generous! But as I pointed out to you in a subsequent telephone conversation, the USAFA does not accept scholarships so we established a yearly North American Aviation Recognition Award for the two best graduating cadets in the Aeronautical Department, the best graduating cadet in the Astronautics Department and the best in the USAFA Prep School. We have established a fund to keep these awards in perpetuity! I admit that this put a definite dent in our available funds so your donation was very timely and heavenly received!



Congratulations and Best Wishes to

John and Margaret Gejer of Hawthorne, California
celebrating their 70th Wedding Anniversary

Edward and Kathleen Lahey of Redondo Beach, California
celebrating their 66th Wedding Anniversary

Raul and Kathleen Solorio of Banning, California
celebrating their 50th Wedding Anniversary

Richard and Ann Westphal of Oro Valley, Arizona
celebrating their 50th Wedding Anniversary

Russel and Sandy Monroe of Orange, California
celebrating their 45th Wedding Anniversary

May you have
Enough happiness to make you sweet,
Enough trials to make you strong,
Enough sorrow to keep you human,
And enough hope to make you happy.

The Silent Majority

by Stan Guzy

BAKER, DWIGHT I., 93 – passed away on August 11, 2010 at Lake Oswego, OR. Dwight joined Rocketdyne as a Senior Technical Specialist in the late 1950s. His primary field of expertise was "combustion instability" and he was instrumental in resolving the injector issues with the Apollo F-1 engine.

BEST, REUBEN D., JR., 84 – of Amesbury, MA, passed away on August 23, 2010. Reuben was a Staff Sergeant with the 398th Bombardment Squadron, 504th Bombardment Group surviving a crash landing on Iwo Jima. He joined NAA at the Columbus plant and was the first inductee to the OV-10 Hall of Fame. Burial was with full military honors.

BIRD, OLVIS R., 94 – of Tucson, AZ passed away on October 15, 2010. Olvis joined NAA at LAD, and then went on to work at the Downey and Long Beach facilities. In 1951, he transferred to the Columbus Division and retired in 1978 as a manager in the Experimental Department with 37 years of service. He is survived by his loving wife Marlene.

BOWEN, MAX, 100 – of Irvine, CA passed away October 10, 2010 from undisclosed causes. He was born in Logan, UT and had a 30-year career as an aerospace engineer working all over the U.S. and retiring from NAA/RI in California.

BROWN, PAULINE M., 91 – a 40-year resident of Torrance, CA, passed away on August 27, 2010. She joined NAA as a secretary immediately after graduating from high school. She enjoyed dancing, collected antiques and loved cats. Pauline was a gentle lady.

CARLSON, ALAN H., 74 – died on May 16, 2010 at Elizabeth Lake, CA. Alan joined NAA in 1953 and retired 37 years later from the Space Shuttle program in Palmdale. He fulfilled a lifelong dream and sailed his boat *Cool Change III* with his wife Jan all over the world for four years. He returned home and settled down to a life of music, photography and spinning yarns.

CLUNE, JAMES G., 81 – passed away in Auburn, CA on May 3, 2010. He retired from LAD as an electrical engineer in 1986 with 28 years of service. Jim was a "Lost Sheep" but now is found. God bless him.

EDDELMAN, THOMAS N., 94 – of Orange, CA passed away at home on October 24, 2010. Tom retired from Autonetics in 1977 with 26 years of service. Club racing and cars were his passion. He drove an "H" Production Sprite at Riverside, Willow Springs, Buttonwillow, and Fontana raceways. He was predeceased by Ursula, his loving wife of 51 years.

FERRI, GEORGE P. "GALLIANO", 80 – of Howard, OH, passed away on August 29, 2010. A U.S. Navy Korean War veteran, George earned a Master's degree in Management and joined the NAA Columbus Division. He retired with 40 years of service and was a Past President of the Rockwell Management Club and a National Management Man of the Year. He is survived by his wife Alyce Jean.

FUNK, ESTHER, 87 – passed away on September 17, 2010 in Paonia, CO. Esther joined NAA in 1942 and worked on the B-25 nose assembly. In the early 1960s, she moved to the Garrett Corporation and then returned to the NAA Crenshaw Division. Esther is survived by her loving husband of 67 years, Jerry. They both retired from NAA in 1978.

GARDNER, FREDERICK H. "FRITZ"– passed away October 11, 2010 from undisclosed causes. Fritz had served in the military for several years including the U.S. Army Signal Corps and the U.S. Air Force before he began his career with NAA/RI where he held positions in management and as a member of the Senior Technical Staff and as member of the team that developed the space capsule. He retired in 1982 after 32 years of meritorious service. His wife of 63 years, Libby, predeceased him in December 2005.

HARDACRE, DONALD, 85 – died of respiratory failure on September 30, 2010 at Eisenhower Medical Center in Rancho Mirage, CA. He began his career at the NAA Downey facility as a bench worker in 1952 and retired from the Autonetics Division in 1982 as a technical writer. He is survived by his wife of 57 years, Martha.

HEMMERLING, EDWARD D., – passed away on September 29, 2010 at Placentia Linda Hospital. He had suffered physical issues over the years, having been one of the first recipients of a heart valve transfer over 40 years ago. He waged a good battle but his heart finally gave out and he passed quietly with his family around him. Ed retired from Autonetics in 1989 after 35 years of service.

HUGHES, JAMES H., 93 – of Long Beach, CA, passed away peacefully at home on August 27, 2010. Jim retired from Space Division in 1983 with 42.5 years of service. He was an electrical test engineer on the P-51, B-1, and the Apollo. He learned to fly as a youth in Aberdeen, SD and returned at 93 to repeat the flight.

IRETON, ROBERT W., 84 – entered eternal life on September 15, 2010 from undisclosed causes. He was a veteran of WWII having served in the U.S. Navy. He worked as a machinist for NAA for 38 years before retiring in 1990.

KIRBY, LOWELL, 87 – passed away in his home in Sylmar, CA as a result of a stroke. Lowell came to LAD in 1948, serving in Manufacturing Scheduling. He retired from Engineering Scheduling. He is survived by his wife Luella.

KNEPPER, JOE J., 84 – died of natural causes on September 25, 2010 at his home in Oceanside, CA. Joe served in the U.S. Army, afterward obtained a Master's degree in Aeronautical Engineering. He joined NAA and served for 40 years, working on many projects including the Saturn V rocket, the Space Station and the B-1 bomber.

LAIDLAW, WILLIAM R. "BOB", 83 – whose aerospace career included roles as combat pilot, researcher, past president of the Society of Experimental Test Pilots, engineering executive and founder of two companies, died on April 2, 2010 of bladder cancer. He resided in Nevada City, CA. Bob "fudged" his age while in a Toronto high school, joined the Royal Canadian Air force and flew photoreconnaissance missions in Mosquito aircraft during WWII. He later earned his M.S. and Ph.D degree from MIT, specializing in aeroelasticity. Later, he joined NAA and helped pioneer flutter-testing techniques on the T-28C, FJ-4 and A3J-1 Vigilante. To determine the effects of an atmospheric nuclear detonation on exposed aircraft, he flew instrumental FJ-4s during tests at Nevada and the South Pacific. As director of NAA's Advanced Systems group, Bob led the proposal team that won the Apollo Command and Service Module contract. In 1964, he was named LAD Vice President for research, responsible for supporting the X-15 and XB-70 flight test programs. At the same time he served as a consultant to the Department of Defense where he became a carrier-qualified naval aviator. In 1968, he moved on to form his own flight-testing company, retiring in 1984.

LAPPEN, CURTIS H., JR. "CURT", 79 – of Redondo Beach, CA, died on August 20, 2010 at St. John's Hospital in Santa Monica, CA. After graduating college, Curt served our country as a Navy Fire Control Seaman, and then came to LAD. He retired in 1992 as Vice President of Quality Assurance with 40 years of service. Curt is survived by his loving wife, Ida.

LAMBASE, JOHN, 88 – passed away at home in San Pedro, CA amidst his family members. He served in India during WWII and later obtained a chemical engineering degree from Tri-State College. He was an excellent welding engineer at LAD and, later, in Space Division. He subsequently became a metallurgist in the Downey M&P department. Johnny is survived by his wife Vera.

LOGAN, THOMAS T., 80 – passed away at UCLA Medical Center on September 19, 2010. Graduating from the University of Wyoming in 1958, Tom joined NAA as a thermodynamics engineer. He retired in 1996 with 37 years of service. He is survived by his loving wife of 55 years, Dorothea.

McGREGOR, EMMA F., 84 – of Carlsbad, passed away on March 3, 2010. Emma retired from Autonetics in 1990 with 16 years of service in Personnel where she rose to Management. During WWII, she went to work at the Pentagon. Emma is remembered as a fine lady.

McINTYRE, JOAN M., 74 – of Los Alamitos, CA, lost a heroic battle with cancer on August 18, 2010. Joan graduated from Queens College in New York in 1957 with a B.S. in Mathematics. She married John McIntyre in 1959 and drove out to California where she became a traditional stay-at-home mom, raising five children. In 1980, she joined Rockwell at Seal Beach and was assigned to the Mass Properties unit. She was involved in the spin balance/weighing of the first thirty-nine GPS satellites launched. Along the way, she joined the Rockwell running team and completed 225 company sponsored 5K races, winning the majority in her age group. She later joined the Easy Striders Race Walking Club, raced along the Great Wall of China and in the International Seniors Track Meet in Riccione, Italy. In June, Joan climbed a mountain in Sequoia, took 1st place in a 5K run a week later. In August, she climbed the highest mountain to be with her Maker. Joan is survived by her loving husband John. She was a lady to be reckoned with!

McMAHON, BILL, 91 – was reunited with his wife, Lee in the hereafter just after midnight September 18, 2010. He was a WWII combat veteran and an aerospace engineer for 30 years with NAA/RI.

MOORE, TIMOTHY, 76 – passed away peacefully on October 27, 2010. He traveled throughout the U.S. working in sales for Autonetics and settled in Manhattan Beach, CA in the mid-1960s as Vice President of Sales for Genesco.

MORIWAKI, NORI – of Richland, Washington passed away on July 2, 2008 of heart and pneumonia complications. At the beginning of WWII, Nori and his family were relocated to an Internment Camp for Japanese Americans. He later joined the U.S. Army and was assigned to the 442nd Infantry Battalion, the highest decorated unit for valor and meritorious service in WWII. Nori served at LAD before transferring to the Hanford facility in Washington in 1982. He retired in 1987 with 34-1/2 years of service.

MURRAY, CHARLES D., SR., 87 – of Anaheim, CA, passed away on August 14, 2010. Charles served in the Navy during WWII and in Army Intelligence in post-war Europe. He joined North American in Downey and served for 33 years before retiring in 1986.

O'BRIEN, WALLACE L., 84 – passed away in Albuquerque, NM on July 10, 2010. Wallace was a Seabee in the South Pacific during WWII. He graduated from Bradley University in 1950 and joined LAD as an engineer and received an Engineer of the Year Award in 1977. He retired in 1991 with 40 years of service. Wallace is survived by his loving wife of 61 years, Ruth.

QUINN, JAMES J., 79 – of Reynoldsburg, OH passed away on October 25, 2010. Jim retired from the Columbus Division with 34 years of service. He is survived by his loving wife of 59 years, Betty.

ROGERS, CHARLES "ROD" – of Lakewood, CA left this earth in December 2009 after a two year battle with urinary tract and bone cancer. Rod served in the Procurement section doing Subcontractor Surveillance and Purchase Parts Support for programs being conducted at both the B-1 and Space divisions. He left the Space Division in the early 1990s.

SHULTZ, JACK, 88 – passed away October 4, 2010 from pancreatic cancer in Desert Hot Springs, CA. Jack served in the Coast Guard during WWII. At NAA, Jack served in the Material Department as the administrator for personnel. All considered him "a person of integrity who worked for what was deemed best for the company and the employee". He retired in 1983 after 33 years of service.

SMITH, ALFRED K., 84 – of Hemet, CA passed away on October 27, 2010 at Menifee Hospital. Al led a distinguished life in the Navy and served 25 dedicated years with NAA/RI as an engineer. Al is survived by his loving wife of 37 years, Leila.

SMITH, CARL E., 87 – of Cayucos, CA passed away on August 25, 2010 after suffering a major stroke. Carl was a decorated U.S. Navy veteran after surviving the 37-second sinking of his ship, the *USS Cooper*, when it was hit in Ormoc Bay in the Philippines. After the war, he graduated from USC with a degree in electrical engineering and joined Autonetics. He retired in 1969 with 20 years of service. Carl is survived by his loving wife of 47 years, Ada. She is also a retiree, having served at Columbus Division and Autonetics.

SMITH, RAYMOND – of Crescent City, CA died in February 2007 from ALS, Lou Gehrig's disease. Ray joined NAA at LAD and transferred to the Space Division. At Space Division, he served in Manufacturing Scheduling, progressed to supervisor and retired as Manufacturing project manager in the early 1990s.

THIBODEAU, WILLIAM E. "BILL", 82 – of Bozeman, MT died in an auto/truck accident near Idaho Falls, ID on April 22, 2009. Bill enlisted in the U.S. Navy during WWII. Following the service, he had a very successful career working on Air Force One during the Eisenhower era. Later, he moved to California to join Space Division in various managerial positions. Bill retired in 1989 with 25 years of service. He is survived by his wife, Maryann.

VANASSE, MAURICE A., 87 – of Artesia, CA, passed away on August 31, 2010. Maurice served his country during WWII, graduated from MIT and received his Master's degree from Brown University. He joined NASA and was instrumental in the construction of the first Moon Rover. He later retired from Rockwell International. He is survived by his wife Cindy.

YBARRA, ALFREDO, 77 – succumbed to liver failure at home in Orange, CA on August 26, 2010. Alfredo joined LAD in 1954, serving in Purchased Parts/Purchased Labor on the F-86 and F-100 programs. His career took him to Rocketdyne and, subsequently, to Autonetics where he was a Senior Procurement Agent for 38 years on many programs including the Minuteman Guidance System, Apollo, Space Shuttle, and the Submersible Inertial Navigation System (SINS) program. He retired in 1992. Alfredo is survived by his wife of 54 years, Carmen.

LOST SHEEP – BULLETIN RETURNED WITH NO FORWARDING ADDRESS

GARY A. ODERKIRK – BLAINE, WA

ROBERT E. OLSEN – REDLANDS, CA

NORTH AMERICAN AVIATION
RETIREES BULLETIN
P.O. Box 3797
Seal Beach, CA 90740

North American Aviation Retirees Bulletin

"Where The Best Never Rest"

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IF THE DATE ABOVE YOUR NAME IS DECEMBER 2010 AND YOU HAVEN'T YET RENEWED –
THIS IS YOUR LAST ISSUE!



Photo via John Sandford

Our Space Shuttle Phase C/D Proposal Cover consisted of an oil painting by Bert Winthrop. Summarizing the Proposal themes from 12 o'clock: 1) The Space Division Team designed and built the Saturn S-II and Apollo CSM, 2) Space Division Plan entails teams across the Nation, 3) NAR has history of complex aircraft, missiles, spacecraft and rockets, 4) Space Division is part of NASA Launch Team, 5) Buz Hello, Bill Dean, Charlie Feltz are proven program executives, 6) center: Space Division Shuttle System Baseline.

North American Aviation Retirees Bulletin

"Where The Best Never Rest"

Spring 2011

Inside:

THE A-5 VIGILANTE – A HISTORIC NAA WEAPON SYSTEM by Roger Wood

THE PROPOSED NAA DELTA WING X-15A-3 by Dave Stern

ZEROING IN ON THE ZERO by Jim Rearden

SALUTE TO THE NAA RETIREES BULLETIN SILVER EAGLES by A Grateful Staff



NASA/Victor Zelentsov Photo

NASA astronaut Tracy Caldwell Dyson, along with Russian cosmonauts Alexandr Skvortsov and Mikhail Kornienko, prepares for lift off aboard the Soyuz TMA-18 from the Baikonur Cosmodrome in Kazakhstan on April 2, 2010 to serve as the Expedition 24 crew on the International Space Station.

NORTH AMERICAN AVIATION
Retirees Bulletin

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The NAAR Bulletin can be contacted at The Boeing Company, Seal Beach facility by phone at (562) 797-3836. Send mail to:

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Dear NAA Retirees Bulletin Subscriber

With this issue, we begin our eleventh year as an independent publication relying solely on our readers to survive. We are pleased by the many letters of encouragement that we continually receive from you. However, we are also saddened by the number of you that have left us for the Silent Majority! Every year we watch the renewal rate and we find fewer and fewer checks coming in. The core of subscribers that have sustained us over the years are the Silver Eagles. We have never acknowledged them by name so we are saluting them in this issue! Too many are gone and some are Lost Sheep but all have a special place in our hearts. As you read down the list of names, many of them will bring back memories. We hope that most will be happy ones.

Once again, the Bald Eagles will hold their yearly luncheon on April 30, 2011. The speaker this year is an outstanding pilot, author, historian and aviation archeologist. His name is Ralph Wetterhahn and he is a real live "Indiana Jones", having traveled through all the dark corners of the world in search of aircraft wrecks and our missing-in-action. He served three tours in Vietnam, flying fighters in both, the USAF and the Navy, and is credited with one MiG-21 victory. He flew 180 combat missions in the F-4 Phantom and A-7 Corsair, made 144 carrier landings and, later, logged 1,000 hours in the F-15. Long-time readers of the Bulletin will recall his report on how the Communists recovered our crashed F-86 off the beach in North Korea and trucked it to Moscow to learn of our radar controlled gun sight! If you never attended one of these reunions, this is the one to attend. In fact, this is the one to invite your lady to attend! We think Ralph is that good! All divisions are in attendance and last year we had folks come all the way from the Columbus facility in Ohio. See the Block Announcement further on in this issue.

And from the Columbus Division, we have a wonderful report about the design and construction of the showstopper Navy A-5 Vigilante. Roger Wood was in Contracts at Columbus and saw the airplane come together! Here he highlights all the fantastic advancements that were introduced with the vehicle!

Dave Stern, our historical sleuth from cold Renton is also back with another historical episode about a proposal that was buried deep in the dusty files of the National Archives. It is an NAA follow-on proposal to the X-15 program. It never got to the metal cutting phase but it reflected the huge talents that resided in the Los Angeles Division. Every project was considered an advancement in knowledge to produce an even better product.

Finally, we have a story about the Japanese "Zero". It has nothing to do with NAA but it shows how a chance event can affect an entire war. It makes for a fascinating story!

Our covers illustrate the delivery and return of the Expedition 24 crew to the International Space Station last April. The method is more related to the Apollo missions than the current Space Shuttle. It may be crude but it works! That's more than can be said for our politicians.

The A-5 Vigilante – A Historic North American Weapon System

by Roger Wood

Author's note: Readers may recall that NAA-Columbus was the leading airplane contractor for the U.S. Navy. The Vigilante was the Division's most advanced aircraft and this is a comprehensive review of its capabilities and some of its legacies that remain relevant today.

The RA-5C Vigilante, a high performance carrier-based aircraft fielded during the Vietnam War, became one of the most effective tactical reconnaissance systems ever made available to American forces.

America discovered significant new war fighting lessons during the Vietnam, Balkan, Iraq and Afghanistan conflicts, including the importance of multi-sensor tactical reconnaissance to collect a wide range of real-time intelligence in the combat theater.

America's benchmark capability for tactical reconnaissance has long been the RA-5C Vigilante, a remarkably advanced system originated in the Cold War by Navy leaders who had the foresight to envision the need for multi-sensor tactical recon.

The Vigilante was started in 1955 as an advanced Navy attack aircraft capable of over-the-beach delivery of both nuclear and conventional weapons. It was originally designated A3J-1, then A-5A when the DOD redesignated aircraft in the late 1950s. Its versatile airframe and electronics served as the basis for evolution in 1960 to the RA-5C, a full-capability reconnaissance system that supported naval aviation's growing tactical warfare role at the same time that the SR-71 and special satellites were being developed for strategic or "national" intelligence collection.

The Vigilante served for two decades as America's most fully integrated tactical reconnaissance capability, including exemplary duty off Yankee Station during the Vietnam conflict.

Along the way, the Vigilante left some very enduring legacies:

- Modern Technology – It is readily apparent that this aircraft—originated for high speed, low-altitude, carrier-based attack—was a ground-breaking design. Its modern variable geometry inlets and its overall configuration paved the way for the Navy F-14 and F/A-18 fighters, the USAF F-15 fighter and late-generation MiG fighters. It also had precedent-setting electronics like the first airborne digital computer and inertial navigation, the first operational fly-by-wire flight controls and first subsonic and supersonic escape system.
- Integrated Reconnaissance – The definitive Vigilante was the RA-5C which, with its shipboard Integrated Operational Intelligence Center (IOIC), served as the fleet's tactical warfare eyes. The RA-5C/IOIC demonstrated that tactical intelligence collected by a well-integrated, full-spectrum, multi-sensor system under the control of theater commanders remains vital in both traditional and asymmetric conflicts.
- Management Successes – The Vigilante provided a case study of practices that could benefit 21st Century defense procurement. These include rapid, evolutionary development of new systems, single-point integration responsibility, and a prudent level of concurrency between development and production. The Vigilante proved that these can be brought together to solve DOD's most vital management need – more affordable and timely defense systems.



The RA-5C Vigilante, a high performance carrier-based aircraft fielded during the Vietnam War, became one of the most effective tactical reconnaissance systems ever made available to American forces.

How the Vigilante Program Started

For a decade and a half after WWII, Naval Aviation forces had the responsibility to deliver both nuclear and conventional weapons over the beach and to the enemy's heartland in the event of major hostilities.

To do so, the Navy used subsonic AJ-1 Savages and A-3D Skywarriors to satisfy its nuclear attack mission. However, improving Soviet radar made these subsonic aircraft obsolete and fast-breaking U.S. technologies became available for new operational doctrines. Among these was the concept of a high speed, under-the-radar attack aircraft with very accurate long-range navigation, weapon delivery and electronic countermeasures to suppress enemy defenses. Such an aircraft could also be adaptable for high-speed, multi-sensor reconnaissance, anticipating a world in which enemy capabilities would be ever more dispersed and mobile.

The A-5A was selected in 1955 to satisfy this advanced new mission.

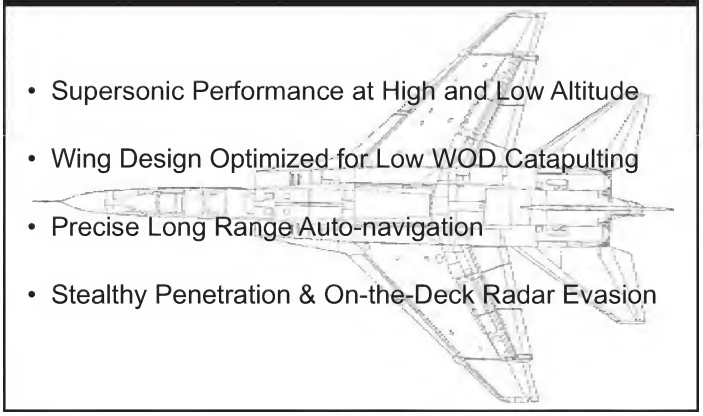
Subsonic performance had become outdated with many military planners in the 1950s and the high performance mission requirements levied on the Vigilante were very demanding. The requirement for supersonic penetration at both high and low altitude would probably have led to a variable geometry wing design today. But that technology was not yet feasible in the 1950s. Electronic mission requirements were likewise at the cutting edge. These included very precise long-range navigation and bombing accuracies, requiring a totally integrated system that linked navigation, weapon delivery and flight control.

Similarly, a fully integrated defensive countermeasures system was required because enemy threats had advanced to the point that they were becoming radar controlled, including the capability to track jet engine exhausts.

Trading off and optimizing a configuration for these diverse requirements led to many of the Vigilante's technology advancements and flexibility for future growth. The final design addressed supersonic high-low altitude performance with a thin, sharply swept wing having 700 sq. ft. of area and blown flaps. Slot deflector spoilers were used instead of ailerons for high speed, low altitude stability and control. And it had the first operational fly-by-wire flight controls.

These were highly advanced technologies for the time, providing excellent transonic low altitude performance combined with Mach 2 high altitude performance. Moreover, the Vigilante's low wind-over-the-deck launch capabilities provided tremendous potential for payload and range growth.

Original Vigilante Mission Requirements



- Supersonic Performance at High and Low Altitude
- Wing Design Optimized for Low WOD Catapulting
- Precise Long Range Auto-navigation
- Stealthy Penetration & On-the-Deck Radar Evasion

The A-5A's many operational "firsts" are shown below; all of which were fully integrated, and enabled evolution from the attack to the tactical reconnaissance missions.

Vigilante Operational Firsts

Airframe

- 1st Supersonic High/Low Altitude Carrier Aircraft
- 1st Production Fly-by-Wire Flight Controls
- 1st Deflector/Spoiler Controls (no ailerons)
- 1st Variable Geometry Horizontal Ramp Inlets
- 1st Integrated Linear Bomb Bay System
- 1st Subsonic and Supersonic Escape System
- 1st 400 Cycle AC Power System

Electronics

- 1st Integrated Inertial Navigation/Bombing/Controls
- 1st Digital Navigation & Bombing Computer
- 1st Production Heads-up Display System
- 1st Integrated Terrain Avoidance System
- 1st Integrated Electronic Warfare System

The A-5A Development Program

From the day in late August 1958 when the Vigilante first flew in the hands of NAA-Columbus test pilot Dick Wenzel, it was clear that this was to be a remarkably capable aircraft with a clean aerodynamic design and highly integrated controls. In June 1960, aviatrix Jackie Cochran, President of the Federation Aeronautique Internationale, became the first woman to fly Mach 2. Riding in the back seat, she participated in a Vigilante speed run that reached Mach 2.2 at 47,000 feet. This was followed by a world altitude record in the 1,000 kg class when a Vigilante flown from Palmdale, CA by Navy CDR Leroy Heath and LT Larry Monroe reached 91,451 feet, earning them the Distinguished Flying Cross and Air Medal, respectively.

Ed Gillespie, who became NAA/Columbus Chief Test Pilot, recalls the Vigilante's great performance capabilities. In May 1963, he flew an RA-5C from Columbus to NAS Sanford in a high mach, high altitude, max-range flight that today's F-22 pilots would refer to as a "supercruise" mission. With 22,000 lb. of fuel at take-off, Ed maintained Mach 1.5 to 1.8 speeds at varying altitudes between 35,000-50,000 feet and took only 58 minutes from brake release in Columbus to landing at Sanford. The aircraft's inlet/engine design was exceptional and Gillespie easily flew past 70,000 feet in afterburner blowout tests. After burner blowout at about 65,000 feet, the aircraft continued to coast over the top without engine shutdown. The aircraft also had a high-q structure for low altitude/high speed attack, and flutter testing was safely performed at Mach 1.35 (approx. 1,000 mph) at 7,500 feet. In an "over-the-shoulder" bombing maneuver at Tonapah, NV, Gillespie reached Mach 1.3 at 500 feet altitude, breaking the windows in a block house monitoring the flight and duly impressing the occupants. There are few aircraft even today that can fly that fast at low altitude and,

to the chagrin of the fighter jocks, RA-5Cs in Vietnam could outrun Navy F-4 Phantoms in level flight acceleration.

Vigilante structural testing covered unprecedented static strength and fatigue life levels. Its structural design also included several "firsts", including the use of 2020 lithium aluminum alloy in the wing and the first use of H-11 steel in strength-critical fuselage machined parts.

One of the reasons that the DOD has affordability problems with defense systems today is that development cycles are often two decades or more for complex systems and even a decade-plus for non-complex items. The development cycle for the Air Force F-22 fighter, started in the early 1980s – stretched out to over 20 years – was not operationally fielded until 2005.

But, the sophisticated Vigilantes were developed and fielded much faster than systems being procured today.

The A-5A's development cycle from go-ahead in mid-1955 until first flight in mid-1958 was only three years, and then it took only another two years until it was operationally fielded.

The extremely advanced RA-5C took 3-1/2 years from development go-ahead in late 1960 to operational fielding in mid-1964. This period included development of its ship-based Integrated Operational Intelligence Center (IOIC).



U.S. Navy

	A-5A	RA-5C
Go Ahead	June 1955	December 1960
First Flight	August 1958	June 1962
Deployment	June 1960	July 1964

The Evolution of Naval Reconnaissance

After WWII and into the 1950s, U.S. intelligence focused on strategic threats, and used single, non-integrated sensors. The Navy flew the North American AJ-2P, Martin P4M-1Q, Douglas A3D-2Q/P and Vought F8U-1P to perform photo and signal intelligence missions from bases around the world. But these assets were not equipped for full-spectrum, multi-sensor reconnaissance. Consequently, they did not support an emerging view at high command levels that naval aviation would soon need more complete reconnaissance capabilities.

These new tactical intelligence capabilities were identified and firmed up in 1957-1959 under the leadership of the Chief of Naval Operations, Admiral Arleigh Burke, with support from Navy leaders like Admirals James Russell, Robert Pirie and William Schoech.

Their thinking was guided by far-reaching changes they saw on the horizon. Although strategic targets seemed to be the leading mission for all services in the late 1950s, there were those like Admiral Burke who foresaw that the Air Force Strategic Air Command and the Navy's Polaris submarine fleet would be given the mission of targeting the majority of Soviet strategic threats. It was also clear to Admiral Burke and his team that the principal mission of U.S. Navy carrier task forces would then become worldwide tactical force projection and rapid response to local conflicts.

In other words, tactical operations would become the main role of naval aviation, meaning that comprehensive and timely tactical reconnaissance would become far more important than before. And, it could not be limited to historic single-sensor collection, because rapidly advancing enemy capabilities and improved force mobility in the tactical theater would require integrated multi-sensor recon. Finally, the new system needed to be under combat theater control for rapid threat assessment and targeting, rather than under CONUS control as had become characteristic of strategic recon operations.

As a result, considerable thought was given to carrier-based tactical reconnaissance. Future conflicts were expected to be characterized by highly dispersed and mobile forces, as well as a wide variety of weapons and rapidly changing battle area conditions. As an example, while a typical WWII over-the-beach assault mission might have engaged enemy forces within a few miles radius, post-WWII technologies were greatly extending the mobility and range of combat, thereby significantly expanding the battle theater. This made comprehensive tactical intelligence from hundreds of miles beyond the initial engagement radius essential to effectively counter enemy aircraft and other fast-moving mobile threats, including facilities like radar sites vectoring enemy aircraft. Likewise, the enemy's overall mobility capabilities must be destroyed to deny reinforcement of its positions.

This all meant that intelligence data on the entire tactical area would have to be collected continuously, then verified and updated; requiring a dramatic increase in the frequency of flight missions to deal with battlefield changes and rapidly moving forces. Day-night and all-weather collection sorties must be possible to deny the cover of darkness and inclement weather. A variety of image-forming camera, radar and infrared sensors would be needed, and detection of electromagnetic target emissions would be required by passive sensors to defend against radar and communication threats. From these mission requirements it became clear that the Navy needed a multi-sensor system that could collect and correlate a wide range of intelligence, permitting timely and continuous updating of Orders of Battle for effective tactical operations.

It also became clear that such an airborne system would have to be matched and integrated with a shipboard system capable of processing, analyzing, storing and disseminating image forming (photo, IR and radar) and non-image forming (ELINT) mission data to rapidly update Orders of Battle and provide essential targeting, countermeasures, weapon loading and fueling information for carrier-launched attack aircraft.

The original A-5A Vigilante airframe and electronics platform fit these mission needs well and was selected on the strength of its performance, versatility and its affordability as a derivative system. Its high altitude, Mach 2 performance provided good survivability over hostile areas. The advanced wing design enabled excellent growth for increased range and radius of action. Its linear bomb bay provided the large internal area needed for flexible installation of reconnaissance sensors. Finally, the A-5A was already equipped with a modern inertial navigation and bombing system capable of precise positional accuracy for tactical reconnaissance.

In mid-1958, the Navy and NAA developed a detailed description of the Vigilante as a reconnaissance system, including sensor state-of-the-art analysis and mission planning. This

led to a comprehensive report in early 1959, defining the operational RA-5C system and the doctrine for its tactical use.

This report validated that integrated multi-sensor reconnaissance was ready to move forward and that the RA-5C was positioned to be the next generation of such systems.

Coincident with the Navy reconnaissance system definition and funding efforts, North American submitted studies to the Air Force for interceptor versions of the A-5, using a non-afterburning J58 engine that provided full supercruise capability for the system. This configuration was actively addressed among service commanders at a meeting in Williamsburg, VA. In addition, it became apparent to elements of the Navy and DOD that a J58 powered RA-5C recon system could provide excellent strategic intelligence as a supplement for "national" needs. The loss of a U-2 over Russia and shoot-down of an RB-47 in the Kara Sea shortly thereafter further emphasized the benefit of such an RA-5C.

In late 1960, the Secretary of the Navy authorized conversion of two A-5A attack aircraft into the RA-5C recon version, with full funding of an RA-5C production program left to new Defense Secretary Robert McNamara under the incoming Kennedy administration.

Extensive discussions between the Navy, DOD and the USAF were then undertaken during the early McNamara Era as to the possibility of a joint Navy/USAF program for the RA-5C. The Navy's operational need for the system was supported by DOD. In an effort to encourage the USAF to join the program for the Tactical Air Command, McNamara ordered the Navy to revert to the original J79 engine to provide operational utility matching USAF requirements. Ultimately, the USAF chose to use a version of the F-4 aircraft that was already in their inventory. The Navy was then authorized to proceed with full-scale production of the RA-5C multi-sensor recon system to meet the Navy's unique tactical requirements.

The RA-5C was deployed worldwide, aboard carriers in the Atlantic, Pacific and Mediterranean theaters. Its principal combat service was over Vietnam, where its full range of image-forming camera, infrared and side-looking radar sensors were effectively employed along with its non-image forming passive electronic intelligence system. These reconnaissance sensors were all managed by the heart of the Vigilante – the AN/ASB-12 inertial navigation system.

During the Vietnam conflict, the RA-5C's panoramic cameras provided wide focal length, low and high altitude, horizon-to-horizon coverage along the airplane's path. Serial frame cameras obtained general purpose, high and low altitude, forward, vertical and oblique photography. The infrared system obtained and photographically recorded low and high altitude data, and the side-looking radar continuously recorded ground data on both sides of the aircraft.

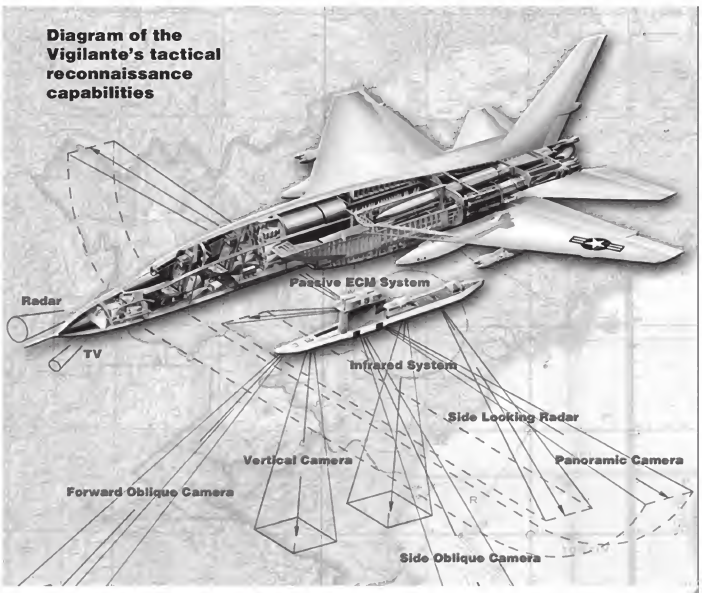
The passive electronics countermeasures system (PECM) received and recorded the electromagnetic environment of an observed area for mission planning.

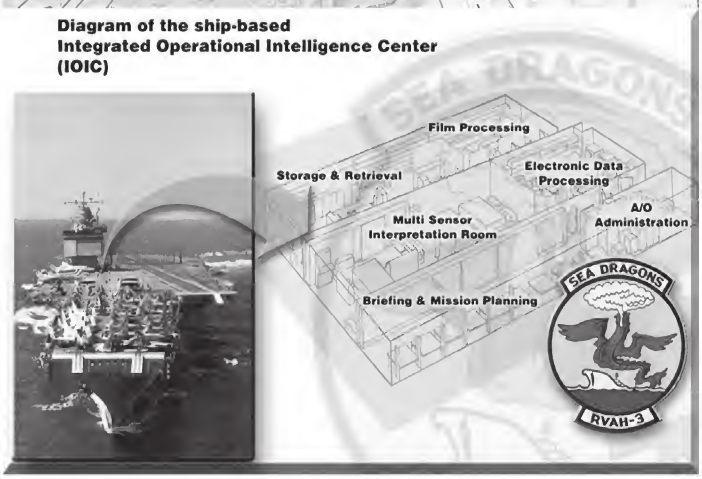
Ancillary mission equipment like an optical cockpit viewfinder was also provided. The RA-5C had over 100 flush mounted antennas for advanced airborne communications and passive/active countermeasures.

In a typical Vietnam mission, the RA-5C would make a high speed, high or low altitude pass over the target area, gathering continuous full-spectrum electronic, infrared, side-looking radar, and serial frame/panoramic photographic data; all correlated as to geographical position and time by a matrix block code recorded on each sensor's media. This matrix was the key to rapid, high volume multi-sensor data handling and analysis. Targets detected by any one sensor could be immediately evaluated by cross-referencing to all other data, providing field commanders with complete and timely information on all aspects of the tactical environment.

After an RA-5C returned to the carrier, its sensory reconnaissance records were processed and analyzed in the shipboard IOIC. The IOIC consisted of advanced electronic processing and analysis equipment for the passive ECM data, photo processing and interpretation, as well as for storage and retrieval of both new and previous databases.

The term multi-sensor reconnaissance also defined the RA-5C's capability to correlate all traces of hostile enemy activity together as the basis for preparing optimum Orders of Battle and mission planning for least exposure to enemy threats. This ability to rapidly matrix photo, radar, infrared and radiation intelligence together enhanced post-damage battle assessment and made future mission targeting much faster and more comprehensive. Prior Orders of Battle and other intelligence bases were stored, permitting fast retrieval and matching of both new and previous target locations to further support rapid Order of Battle updates and appropriate targeting of new threats as quickly as they were identified. The following depicts overall RA-5C airborne and ship-based capabilities:





Key Management Practices

Although the RA-5C was to be a key element of the Navy's expanded tactical aviation role, go-ahead was delayed by various funding issues.

When the RA-5C development was started in late 1960, the Navy needed to field both the airborne and shipboard elements of the system by mid-1964, and the system had to be mission effective and operationally reliable when first deployed.

Faced with these challenges, the Navy/North American team devised management approaches that contributed greatly to the program's success and which can benefit new systems being procured by the DOD even today.

With a very short development timetable and an essentially concurrent production schedule to support the mid-1964 deployment, an expert management team was set up to focus specific responsibility within the Navy and North American organizations for each portion of the system.

North American's development and testing responsibility was significantly expanded under a new procurement approach known as "Weapon System Management". As the integration contractor, North American assumed the responsibility to provide all of the aircraft's new airframe, electronic and sensor systems and had increased responsibility for engine integration. This departure from the traditional government-furnished equipment, or "GFE" approach, was highly beneficial because various systems had to be integrated and tested in parallel, including many reconnaissance sensors. Weapon System Management became a key factor in the successful integration of these systems because it gave North American the freedom to effectively manage interfaces and refine airborne and shipboard system performance, permitting a level of system optimization not possible under prior "GFE" policies. In fact, the RA-5C was the first system ever carried to service use under the Weapon System Management approach and DOD needs to give serious attention to returning to this powerful management tool.

The team made heavy use of non-developmental items to define a system architecture that was sufficiently mature to ensure that it would work when first deployed, but could also be evolved as new technologies emerged. North American was thus able to use major assets like the excellent A-5 airframe and electronics as well as to competitively select among advanced but mature reconnaissance equipments from other programs in which the Navy, Air Force and other federal agencies had invested hundreds of millions. Likewise, North American was able to compete and select advanced non-developmental commercial and military equipments for the shipboard IOIC. The mission effectiveness of this architecture was then optimized by focusing on overall integration of the system.



U.S. Navy

Finally, specific business agreements were established to implement the above management practices in the contracts. These included steps to guard against "requirements creep" that often causes engineering development delays and increased cost under many of today's programs. Terms were also defined to permit effective management of the concurrency between engineering development and initial production.

Many recent defense programs have faltered badly because of unacceptably long development cycles and unaffordable growth of development and production costs. In many cases, the underlying issues with these problem programs have been the same threats that the above Vigilante management practices sought to avoid. As in the era of the Vigilante, success with today's defense systems requires good government/industry teamwork; along with the use of evolutionary rather than "grand designs", clear weapon system management responsibility and positive rather than risk-averse management of concurrency between development and production. Revisiting these lessons-learned from programs like the Vigilante would be very appropriate today as the DOD moves to transform America's military for the 21st century.

Conclusion

The RA-5C thus became the principal U.S. tactical reconnaissance asset in Southeast Asia until the end of the Vietnam conflict.

As an illustration of its capabilities, the RA-5C was used to completely map all of North Vietnam after consistent U.S. bombing errors had been traced to inaccuracies of up to four miles in existing maps.

The RA-5C's speed and handling proved to be of great value over Vietnam, and these characteristics were frequently used to out-maneuver attacking enemy surface-to-air missiles.

Under production contracts starting in 1962, 43 RA-5Cs and 9 carrier-based IOICs were produced followed by conversion of 45 earlier A-5s into RA-5Cs. After a production break, 36 more new-build RA-5Cs were ordered.

Although the SR-71 was originally developed for strategic reconnaissance, it was modernized in the 1990s to serve in a tactical reconnaissance role. When comparing the tactical SR-71 and the RA-5C at that time, a highly regarded national publication described the tactical SR-71 as a "Mach 3 Vigilante".

The Desert Storm and Balkan Wars of the 1990s, as well as the more recent Iraqi Freedom and Afghanistan conflicts, have once again reaffirmed the importance of integrated, multi-sensor tactical reconnaissance.

About the author: Roger Wood served for 35 years with NAA and Rockwell at the Columbus, Ohio Division and at Rockwell's Corporate Headquarters in Seal Beach, California. At Columbus, he worked in management roles on several aircraft and missile programs. At Rockwell Headquarters, he served as Corporate Director - Contracts for Rockwell's Defense and Aerospace programs, and represented Rockwell on several government-industry teams to improve U.S. defense acquisition policy. He retired in 1993 and resides with his lovely wife Joyellen in both Columbus, Ohio and Surprise, Arizona.

The Proposed Delta Wing X-15A-3

by Dave Stern

On March 17, 1967, the North American Aviation Public Relations office released to the media some details concerning four years of research that resulted in the design of an advanced delta wing X-15 research aircraft. In addition, the North American X-15 Program Director, H.A. Evans, also credited the three X-15 research aircraft with attaining hypersonic speeds to extreme altitudes; high enough to qualify three Air Force pilots to receive the coveted "Astronaut Wings".

The updated delta-wing X-15 would be an extension of the original three X-15 aircraft used to verify structural designs for near and future hypersonic cruise vehicles. Known as the X-15A-3, it would be a highly modified generic X-15 used to explore extended hypersonic flight up to Mach 7-8, while verifying airframe component integrity utilizing new exotic metal alloys.

The proposal stated that liquid hydrogen turbo-ramjet propulsion units were undergoing research and development, with examples being ground-tested at Marquardt and other engine manufacturers. This was another reason for building the advanced X-15 HTV (Hypersonic Test Vehicle), a quite logical extension of the USAF/NASA research airplane program that could be modified to accept advanced experimental hypersonic powerplants.

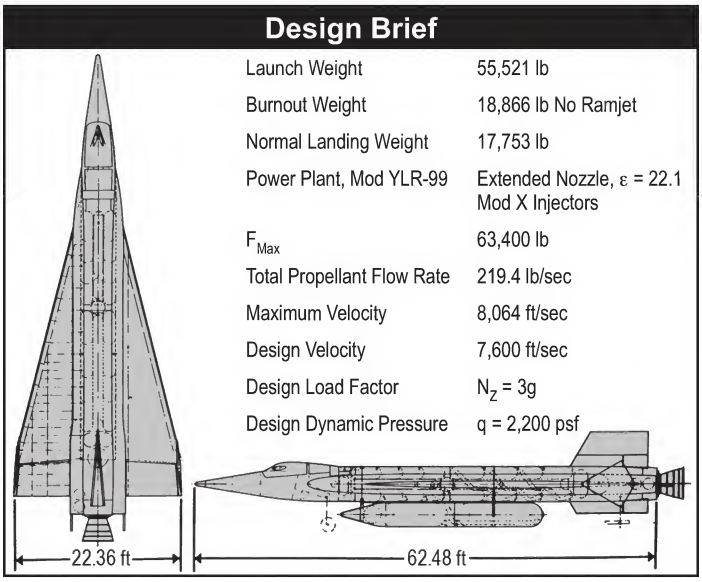
The news release was published in newspapers from California to New York with a tease-photograph of a delta wing X-15A-3 wind tunnel model displaying its radically swept delta wings and sleek lines. The delta wing X-15A-3 proposal was presented in a document entitled *"The Concept of the Delta Wing X-15"* the combined efforts of Senior Aerodynamics Engineers A. Tweedle and L.M. Gaines and Technical Manager E.W. Johnson.

During 1963, a plan was formulated to modify one generic X-15 into a hypersonic flying laboratory to explore the basics of lift, drag, aerodynamic heating and major structural problems that would create engineering problems in designing advanced vehicles such as transports and reconnaissance aircraft flying at sustained hypersonic cruise and sustained high altitudes.

The X-15A-3 would explore two speed regimes, flight from Mach 4 to Mach 6 and from Mach 6 to Mach 8. NAA engineers proposed to modify an existing X-15 with the following additions: a fuselage plug of 120 inches, a severely swept delta wing of 76°, strengthened main landing gear and rear fuselage, repositioned and strengthened nose landing gear, extended fuselage nose, and fixed-position wing tip fins. The initial drawings display the X-15A-3 with upswept wingtips, but the decision was made to utilize fixed diamond shaped tip fins.

The rocket engine of choice was listed as the YLR-99 providing approximately 63,400 lb of thrust with an extended nozzle protruding behind the rear fuselage. X-15A-3 would weigh approximately 55,521 lb at launch, 18,866 lb after fuel depletion, and landing at 17,753 lb. The design parameters included a normal 3.0-g factor with a flight velocity of 7,600 feet per second, maximum velocity being approximately 8,064 feet per second (burning fuel from an externally mounted belly tank.

To conform to the B-52 mother ship, the wing span was nearly the same as the generic X-15 at 22.36 feet but the fuselage plug extended its length to 62.48 feet. The basic internal layout was nearly the same as the generic X-15 with its proven systems, and would utilize the same support or service equipment used for the generic X-15 aircraft.



NAA Drawing

A 3-view of the advanced delta-wing X-15A-3 proposed as a Hypersonic Test Vehicle (HTV) to explore thermal gradients, new metals technology at speeds reaching Mach 8.

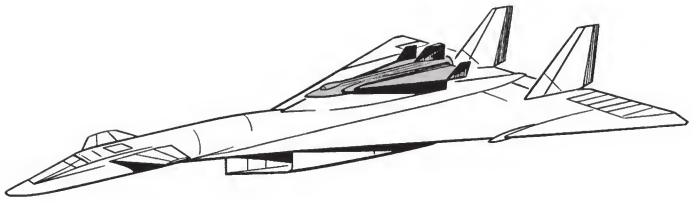
To obtain basic configuration data, two metal wind tunnel models were constructed – a 1/15th low-speed model and a 1/50th scale model for high-speed research – with both models accumulating approximately 300 hours of wind tunnel testing. Testing yielded a projected landing approach speed of approximately 300 knots with a touchdown speed of 196 knots. The X-15A-3 pilot would hold the aircraft at an 11° touchdown angle of attack compared to the 8° for the X-15A-2.

The engineering team created baseline temperature gradients for the structure of the aircraft. Lower wing structures would endure up to 2,100 °F at the leading edge and 1,200 °F halfway along the wing span. The original X-15 HTV upswept wingtips apparently bothered the engineers who stated that diamond shaped wingtips would contribute to directional stability and consequently changed the design. The leading edges of the two wingtips would endure



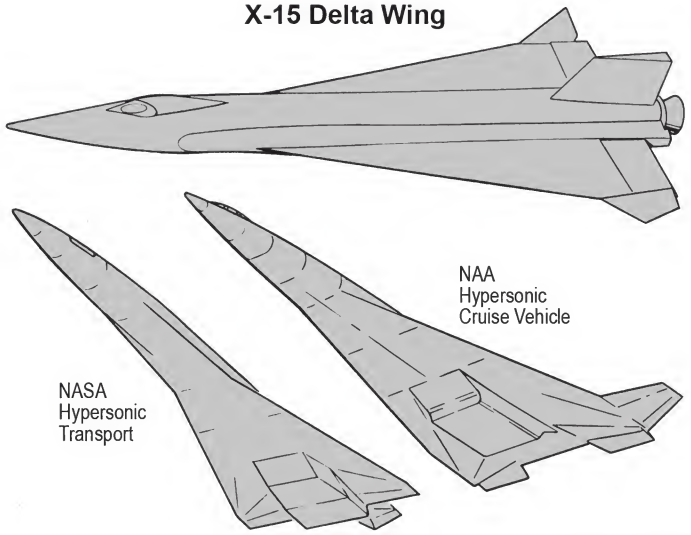
Boeing Archives

One of two high speed wind tunnel models were built that probably accumulated 300 hours of tunnel tests before the final X-15A-3 design gelled.



NAA Drawing

A rough early drawing of the XB-70 and pick-a-back X-15A-3 with initial upswept wing-tips. Although somewhat dangerous at high-speeds the pick-a-back launch method would allow X-15A-3 to reach longer duration high Mach numbers and altitude without initially burning the external belly tank's fuel to achieve its design goals.



NAA Drawing

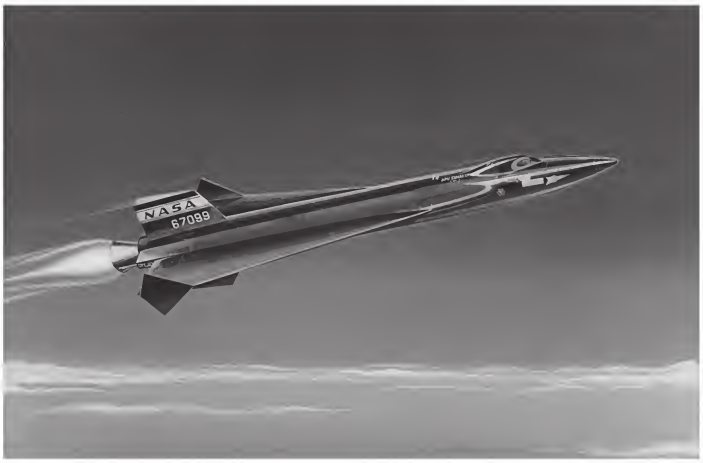
The X-15 HTV engineering team included several projected hypersonic aircraft such as the civil transport and a USAF reconnaissance-bombardment vehicle design, that would benefit from the X-15A-3 program.

2,400 °F, dropping to 1,800 °F. Upper elevon temperatures would reach 1,655 °F, at two feet aft of the hinge line. The lower fuselage temperatures were projected to reach 1,826 °F at Station 50 down to 1,106 °F. near Station 575.

To endure the temperatures generated by higher Mach numbers new and advanced metals would be employed. The engineers planned to apply René 41 in the wing box components and TD nickel on the wing leading edges. The elevons, wingtip fins and fin leading edges would also be composed of TD nickel.

The fuselage side fairing skins would be constructed of René 41, while the side fairing A-frames would utilize HS 1.51 castings. René 41 would also be applied to the propellant tank external skins and internal frame members. The wing leading edge design included removable leading edge segments of 1.5 inches in length with a .003-inch gap allowing for thermal expansion.

The airframe was designed with built-in pressure orifices – 100 for the fuselage, 100 for the right wing and 50 spread throughout the vertical surfaces and elevons. There would be 700 thermocouples – 500 in the left wing, 25 in the right wing and 80 in the vertical and elevon surfaces. The left wing would be rigged with 50 strain gages and 4 skin friction gages, while the vertical surfaces and elevons would contain 20 strain gauges and 2 skin friction gages.



Boeing Archives

Artwork displaying a gussied-up NASA-marked X-15A-3 as it might be observed in flight. The author doubts whether American ingenuity generated a "hypersonic" paint that retained its decorative trim after completing a Mach 8 research flight.

The handsome proposed X-15A-3 would have been a viable and worthy extension of the USAF/NASA research aircraft program, extending manned flight close to double digit Mach numbers. The U.S. economy, however, was quite overshadowed by the manned race to the moon and the conflict in Vietnam, thus mitigating circumstances denied funds to cut metal for the project.

Author's Note: This article was derived from information provided in a mimeographed unnumbered report entitled "The Concept of the Delta Wing X-15" by A. Tweedie, L.M. Gaines, and E.W. Johnson. Drawings were derived from NAA Report NA-66-336.

A Technical Footnote: The "Superalloys" are high-temperature alloys that are useful in the 1,200° - 1,800 °F regime. The lower temperature alloys are iron base, the high temperature are either nickel or cobalt base.

René 41 is an alloy originally developed by GE for jet engine blades. It consists of 20% cobalt, 10% molybdenum, 3% titanium, 1.5% aluminum and the remainder nickel. The aluminum and titanium form a precipitant, which strengthens the metal. However, periods of high temperature and long exposure will eventually dissolve the hardening phase out of René 41, leaving it much lower in strength. TD nickel, on the other hand, is 98% nickel and strengthened by finely dispersed thorium dioxide particles. The oxide has a higher melting point than the nickel, which is ~2,500 °F, and good for a longer time at high temperatures. The HS 1.51 is a special Haynes Stellite alloy. — Larry Korb

About the Author: Dave Stern is a Pen Name. The author served in the USAF with the 4080th Strategic Reconnaissance Wing for nearly 18 years involving cryptographic communications. He rebuilt and flew a Brantly B-2 helicopter in the Central Alaska Interior while performing maintenance on the DHC Twin Otter fixed-wing aircraft and P&W PT6A-20 engines. Now retired, Dave resides in Renton, Washington and has published over 38 articles on aviation-aerospace history and other subjects.

A Salute to the NAA Retirees Bulletin Silver Eagles

by a Grateful Staff

Ten years ago when we were cast out by Boeing, the volunteer staff of the NAA Retirees Bulletin sent out a free issue to 9,600 retirees. Over 3,300 of you responded with a check. Among you were many that sent for the $100 lifetime subscription and even sent more to keep the Bulletin alive. As we expanded the quantity of pages and the quality of our articles, more of you chose to become "Silver Eagles". Thank you Silver Eagles! You have carried us and helped us become the Best!

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THOMAS M. BINDER
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B. L. "BARNEY" BITTING
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JAMES F. BOWER
ELDON L. BOWMAN
HARRY BOYD, JR.
KEITH BOYD
BEN M. BOYKIN
HAL BOYLES
GEORGE L. BRAGG
HUGH M. BRALY
ROY D. BRATZEL
CHARLES W. BRIGHT
ALFRED E. BRINKMEYER
R. E. "DICK" BRITT
JAMES L. BROOKS
KERMIT BROOKS
DEAN W. BROWN
CURTIS D. BROWNFIELD
JACK N. BROWNING
MARY E. BRUGMAN
DUANE D. "BUCKY" BUCCOWICH
ROBERT S. BUCHANAN
PETER G. BUCKMAN
DON R. BUKOVICH
ART & VIOLET BURAGLIO
DONALD R. CABLE
RETA C. CAGLE
VICTOR L. CAMPBELL
STEPHEN W. CARLSON
VIRGINIA CARLSON
JAMES E. CARNEY
JOHN W. CASEY
FRANK J. CHALUPNIK
HOWARD E. CHAMBERS
JAMES E. CHASE
JOSEPH F. CHERNEY
ROGER D. CHRISTENSEN
MAUREEN CHRISTIAN
JOE & JOANNE CICCHESE
MARTIN C. CIOFFOLETTI
ANTHONY F. CIOTTA
JACK L. CLARK
NANETTE CLEMENTS
DENNIS & BETTY CLIFFORD
GARY & BARBARA COLE
JOE COLETTA
RONALD E. COSTELLO
W. W. "WOODY" COTHRAN
MONROE COTNER
RICK COTTON
MARILYN COX
R. J. "BOB" CRAGIN
TED CRAMER
THOMAS R. CRAVETS
GERRY L. CRAWFORD
DON W. CREAGH
ROBERT O. "BOB" CROSS
DON T. CUNNINGHAM
MILTON E. CURTIS
IRWIN DAHL
JANICE Y. DALTON
GEORGE T. DAMOFF
WILLIAM F. DAUGHERTY
JAMES J. DAVIS
CHARLES T. "TOM" DAVISON
CHUCK & BOBBIE DAY
ANN DE BRIERE
WILLIAM E. "BILL" DEAN
RICHARD D. DESKIN
JOHN DEYULIA
E. JOANN DICKERSON-GOODMAN
WENDELL R. DIEKMANN
R. B. "BOB" DILLAWAY
RICHARD C. DIVINSKI
DON & MARY JO DODSON
FRANK E. DOUCETTE
JAMES E. DRISKELL
JOHN H. DUNN
ROBERT E. DUNN
PHILIP R. DURBIN
KENNETH J. DYDA
RALPH L. EAGLEN
ANSON EDWARDS
JOSH EDWARDS
DAVID C. EICHINGER
THOMAS H. ELLIS
W. C. "BILL" ELLIS
WENDALL D. EMDE
GEORGE F. EMERICH
DONALD H. EMERO
HAL E. EMIGH
BERNICE C. ENGLE
JAMES E. ENGLISH
RICHARD B. ERNST
JOHN J. ESLINGER
CHARLES & BETTYE ETZEL
NANCY L. EUSTACE
ROBERT H. EWALD
ENNIS & LINDA FAIRCHILD
BARBARA M. FARR
JOHN FIALKO
P. RICHARD FIELDS
WILLIAM A. FIERSTOS
DONALD T. FILLMORE
S. R. FINKS
AL W. FINLAY
TED J. FINNERAN
JOHN B. FLENTZ
JOHN W. FLYNN
JOHN P. FOSNESS
B. B. "JOE" FOSS, JR.
ELRAY JOHN FRANKLIN
WM. L. FRANKLIN
ROBERT R. FRANTA
C. O. FRAZIER
A. BRUCE FULLER
HARRY GALLANES
PETER GALOVICH
WILLIAM L. GILDEA
WALTER E. GILMAN
JAMES R. GODWARD
THOMAS P. GOEBEL
MARTIN L. GOLDSMITH
TOM T. GONDO
VERLIN E. GOODMAN
ROBERT E. "BOB" GOODWIN
DONALD GORE
JOHN J. GORMAN
JOSEPH R. GOSS
ARTHUR R. GOUDREAULT
CHARLES L. GOULD
W. D. "BILL" GRAZIANO
TOM S. GREATHEAD
MICHAEL J. GREEN
BEVERLY GRESHAM
HOWARD K. GRIGGS
JACK M. GRIMES
ROBERT A. "BOB" GRONLUND
JOHN W. GRUMM
OLLIE "BUD" GUILLOT
ROBERT H. GULCHER
GUY R. GUM
STAN W. GUZY
LARRY HAAS
LESTER G. HALL
CHARLES J. HALLS
MARTY HALPERIN
WILLIAM HALPIN
JOHN HAMMONS
HERBERT E. HANES
PATRICK J. HANIFIN
RICHARD HANSEN
RUSS HANSEN
DONALD A. HARN
SANDRA S. HARVEY
WILLIAM HATTON
MAXINE S. HAUN
HAROLD L. HAYES
PAUL C. HAYES
CHARLES W. HELMS
RAY HEMANN
BLANCHE "DICK" HENKE
DAVE HEROLD
ROSA LEE HERST
TINA HERZOG
GARY P. HETZEL
JOHN S. HILL
PHILIP J. HODGETTS
CHARLES E. "ED" HOFFMAN
VICTOR Q. HOFFMAN
R. L. "DICK" HOFSTETTER
ROGER M. HOLT
EARL & BARBARA HORSTMAN
W. J. "BILL" HOTAREK
ERLE E. HOUGH
EDWARD S. HOUGHTON
BOB HOVDA
MELVIN C. L. HOVE
ERNIE V. HOWARD
JOEL H. HUFF, JR.
A. J. HUGHES
MARIANNE HYSON
SAM F. IACOBELLIS
ROBERT W. ISAACS
RICHARD JACKSON
GEORGE W. JEFFS
RALPH E. JENNICHES
GORDON W. JOHNSON
LOREN E. JOHNSON
MARY E. JOHNSON
MELVIN JOHNSON
KENNETH G. JONES
ROBERT M. JONES
ROY E. JONES, JR.
TERENCE M. "TERRY" JONES
CHARLES F. JOYNER
OTTO C. JUELICH
MICHEL A. JUIF
VIRGIL L. JUST
JOE KABEY
JERRY O. KAGIMOTO
R. L. "BOB" KALDENBERG
WILLIAM M. "BILL" KAMMERUD
LLOYD KAPLAN
LES S. KATOW
G. DAVID KEACH
CHARLES H. KELCH
GARY N. KELLEY

GLENDA KELLY
PATRICK E. KENNEDY
DR. JOHN M. KENNEL
HOWARD A. KENYON
CHARIE KERR
RONALD G. KNIGHT
JOHN A. KOBLOSH
ALAN KOCH
JO ANN KOCK
PAUL J. KOENIG
HENRY H. KONG
LAWRENCE J. KORB
DENNIS E. KOZIOL
CORDELL R. "CORKY" KRABBENHOFT
ALVIN S. KRAVITZ
RAINIS J. KRIGENS
MARILOU DEROCHER KUNZE
GERALDINE P. KURTZ
GALE M. KUZNICKI
G. H. "KYM" KYMLA
HENRY L. LACAYO
DANIEL L. LAFORTUNE
EDWARD T. LAHEY
ALBERT U. LAMKINS
DARRELL W. LANDAU
ALBERT W. LANDECK
YOLANDA & BRADLEY LANDIS
MARGARET LANDRUM
MARY A. LANGON
DON P. LARKIN
N. E. LASSITER
JOHN J. LAUGHLIN
ROGER J. LAWRENCE
SANDY LEATHERBY
NOLAN N. LEATHERMAN
SANG LEE
WAH D. LEE
EDWARD R. LEKAWA
ROBERT L. LEMONS
RALPH D. LEON
RALPH C. LEONARD
DAVID S. LEVINE
WILLIAM J. "BILL" LEVY
WALLACE P. N. LIND
JOY LINDLEY
LAWRENCE E. LIVERS
VICTOR R. LORE
ROBERT & ERIKA LOSEMAN
BILL LOWE
JOHN E. LUCE
GORDON C. LUKEHART
W. DAVID MAC CALLUM, JR.
DON G. MACGREGOR
WALLACE J. MAH
ALAN C. MAHLKE
THOMAS J. MANEY
SANFORD MARGOLIN
MORTON MARGOLIS
DAVID A. MARSHALL
DONALD A. MARTIN
DOYLE MARTIN
JIM MARTIN
NORMAN E. MARTIN
THELMA MARTIN
HARLEN A. MCCARTY
G. P. "PAUL" MCCORMICK
ROBERT E. MCDONALD
GERALD W. MCGEE
WILLIAM B. MCGOUGAN
MARY R. MCINTOSH
JOSEPH P. MCLAIN
DALE J. MCLEOD
JAMES C. MCMILLEN
MARIE MCMULLEN
JAMES A. MCRAE

DONALD A. METZGER
JAMES C. MEWBORN
KENNETH K. MEYERS
DR. MICHAEL MEZZACAPPA
CHARLES A. MICEK
KEITH L. MILBRANDT
EUGENE D. MILES
GERALD W. MILLER
LEROY R. "LEE" MILLER
ROD MILLER
THOMAS W. MILLER
JAMES H. MILLS, JR.
W. D. "BILL" MOCK
RUSSEL D. MONROE
VERNON L. "MONTY" MONTAVON
JOHN W. MONTGOMERY
ARTHUR J. MOON
CHARLES GALE MOORE
JOSEPH G. MOORE
ROBERT L. MOORE
E. R. "ED" MORGAN
G. R. "DICK" MORGAN
WILLIAM MORITA
RICHARD D. MORRIS
NORM MORTON
PHIL MOY
HARRISON C. "CHUCK" MOZENA
NORBERT V. MUCKENTHALER
CORNELIUS MULLINS
CHARLES W. MURPHY
MARY L. MUSICO
DALE D. MYERS
ROBERT F. NEASE
DAN A. NELSON
NORMAN L. NICHOLS
KEN NICHOLSON
ALLAN N. NIKAIDO
HAL NISSEN
T. J. "TERRY" O'BRIEN
GARY A. ODERKIRK
G. A. "JIM" OGLE
MARY OLDHAM
MILO R. OLSEN
JOE ONESTY
RAY & STEFANI OPERACZ
DON J. ORNELLAS
DOUG & RUTH OSBORN
W. D. "BILL" PADIAN
GEORGE H. PAGE
GORDON M. PALMER
DAVID L. PANKOPF
ARTHUR G. PAPP
ERNEST PARIS
AMY L. PARKER
NORMAN PARKER
ANDREW J. PARLETO
THOMAS R. PARSONS
JOHN W. PAUL, JR.
CAROLE A. PAULINO
THOMAS W. PAULSEN
EUGENE E. PENTECOST
AUGUSTINE RONALD PEPI
JOHN R. PERRY
ROBERT J. "BOB" PERRY
ROBERT C. PETERSEN
P. A. PETERSON
MARVIN A. PHILIPPI
RICHARD E. PHILLIPS
JIM M. PIERCE
JOHN J. PIERRO
SOLOMON H. PLEASANT, JR.
VICTOR R. PLUMMER
JACK R. POTTS
PHIL J. PRESCOTT
STAN H. PRICE, JR.

HUGH C. PRYOR
DON QUON
HAROLD RAIKLEN
GEORGE E. RAMBERG
VINCENT E. RAMIREZ
BETTY L. REARDON
PHILIP D. REARDON
DAVID REDFEARN
RICHARD W. REIGHTER
WILLIAM RENNA
FAYE REYNOLDS
EUGENE H. "GENE" RICKETTS
JAMES T. RITCHEY
R. L. "ROBBIE" ROBBINS
RONALD D. ROBERTSON
S. K. "SONNIE" ROBERTSON
HAROLD R. RODDAN
L. ROY RODENBERG
CLINTON L. ROESE
CAROLYN A. ROGERS
CHARLIE ROGERS
DON J. R0HE
JAN D. ROMANOFF
OSCAR A. ROMO
DAISY P. RONCEVICH
ROHN E. ROOKSTOOL
EDWIN H. ROSENTHAL
WILLIAM L. ROWLAND
ARCHIL L. ROY
DONLEY F. "DON" RUDER
PAUL R. RUPERT
EDMUND J. RUSINEK
KENNETH E. RYAN
CHARLES E. RYKER
DON J. SAFARIK
GERALD D. SAMMONS
WILLIAM F. SANDERMAN
JOHN W. SANDFORD
DENVER SANTEE
JAMES "JIM" SARTAIN
B. J. SCHELL
DONALD C. SCHLOSSER
JEFF N. SCHMIDT
JIMMY L. SCHMIDT
ROGER E. SCHMIDT
ROLF D. SCHMUED
ROBERT L. SCHNEIDER
LEO J. SCHORSCH
BETTE JANE SCHUBERT
PAUL E. SCHUBERT
JERRY A. SCHWARZ
AVANELLE "PAT" SCOTT
HARRY A. SCOTT
INEZ SEEFRIED
CHARLES L. "CHUCK" SELL
ARTHUR SEMONE
WILMA D. SHARP-HOUSEGO
ALVIN W. SHAW
NORMAN SHAW
DONALD R. SHEFFER
TAKESHI SHIMAMOTO
FRED SHITARA
JOSEPH F. SIMMS
MARSHALL R. SKINNER
KENNETH D. SKJERVEM
NELSON SLAGLE
C. DUANE SMITH
DALE "DUKE" SMITH
EDWARD P. SMITH
J. R. SMITH
JACK W. SMITH
PAUL B. SMITH
ROBERT A. "BOB" SMITH
GEORGE L. SNYDER
BOB & KATHY SOBOTA

BYRON C. SOLOMONIDES
ROGER D. SONG
LARRY F. STAKELBECK
CHARLES E. STANBERY
TOM STEELMAN
CHARLES STEICHEN
EDWARD J. STEPHENS
WALTER H. STEPHENS
DON STEVENSON
EDWIN J. STEVENSON
DALE & PEGGY STINSON
THOMAS O. STODGEL
JOHN H. STOLPESTAD
LYLE J. STOLTENBERG
C. S. "CHUCK" SUFFECOOL
FAITH SUMMERSON
GEORGE SUZUKI
WIL SWAN, JR.
DAVID C. SWANN
ANITA K. SWANSON
DONALD L. SWENSON
FRANK SZANICS
DOROTHY M. SZUPELLO
ANN A. TACK
KIMI TAIRA
STAN & SANDI TATILIAN
W. F. "BILL" TAYLOR
EARL J. THEAKER
ERNEST A. THIEM
STANLEY E. THIMAKIS
DONALD BRYCE THOMPSON
TOMMY TIJERINA
ALEXANDER A. "DINO" TOIGO
MARION M. TOWNSEND
ARTHUR J. TUOTO
LES & PATTY UNG
ROBERT VALOR
R. S. "DICK" VAN SLYKE
OTIS C. VERNON, JR.
BILL VERSTEEG
DON VILLONI
DONALD E. VOGELBACHER
STEPHEN VON SCHMITTOU
DAVID E. WALLER
WILLIAM J. WARNER
RONALD L. WEBB
E. DONALD WEGNER
R. L. "DICK" WEISS
ANGELA C. WEST
RONALD J. "AL" WESTBROOK
DICK L. WESTPHAL
CHARLES C. WHANG, JR.
EUNICE WHISENHUNT
SCOTT WHITE
STANLEY A. WHITE
CHARLES WHITESELL
LUCINDA A. WILEY
GARY A. WILHELM
JERRY H. WILSON
LEROY & JOYCE WOLFF
NELSON L. WONG
WALLY W. WONG
JULIA L. WOO
MARGARET C. WORTHINGTON
RICHARD E. "DICK" WROBLE
LESTER YAMAMOTO
NORMA I. YARBROUGH
W. R. YOAKLEY
JAMES E. YOUNG
STAN D. ZEMANSKY
FRED P. ZIMMER
FRED ZIMMERMAN

Lost Sheep

EDWARD ARAND, JR.
GEORGE HOWARD ARVIN
LLOYD E. AULT
RICHARD W. "DICK" BADOSTAIN
GERALD G. BROWN
JACK L. BURNSIDE
WILLIAM N. CONRAD
LLOYD C. COOK
ROBERT H. "BOB" COOPER
GEORGE F. FARHAT
EDWAN B. GANGEL
J. A. GARCIA
HAL GORE
LUCY M. KANDROTAS
GEORGE A. MARTA
ROBERT E. OLSEN
GEORGE A. PATTERSON, JR.
KENNETH L. PIERCE
ARTHUR A. RIES
GEORGE K. SIMMONS
JANE S. "GEORGIA" STONE
PHILIP D. WILTSE
W. LEE WILTSE
FRANK ZELINSKI









Silent Majority (Date of Death)

ALBERT L. "AL" AHRENS (07/19/2009)
IRWIN J. ALTNEU (08/22/2009)
KEITH V. ANDERSEN (11/18/2004)
RAY BANNARD (06/23/2009)
PAUL A. BARKER (09/18/2009)
PAULINE I. BARRY (03/15/2003)
WILLIAM S. "BILL" BIRDSALL (03/23/2006)
ARNIE N. BIRDSILL (11/06/2004)
DOMINIC F. BIRGEN (01/19/2005)
C. R. "RON" BISHOP (08/04/2010)
THOMAS A. "TOM" BLAIR (10/01/2009)
CHARLES L. BOSDET (09/24/2006)
ROBERT N. "BOB" CADICK (10/2005)
WILLIAM J. "BILL" CECKA, JR. (12/22/2006)
JAMES G. "JIM" CLUNE (05/03/2010)
JAMES M. COFFEY (06/23/2008)
STEWART M. COMBA (04/08/2006)
WILBERT COOPER (03/04/2010)
DANIEL W. CRAMER (2003)
ROBERT "BOB" CROCKETT, JR. (06/12/2005)
W. I. "BILL" CROWLEY (04/13/2009)
RICHARD P. CULLETON (08/04/2005)
ROBERT W. DAGAND (04/25/2007)
MARY M. DE LONG (10/2008)
VINCENT A. DOYLE (05/17/2006)
JOHN L. DZURICA (11/30/2008)
KARL R. EBY (03/10/2009)
TOM EDDLEMAN (10/24/2010)
HAROLD J. ENGEBRETSON (04/2010)
E. J. "TED" EVANS (06/05/2010)
E. R. "DON" FEDERSPIEL (06/13/2002)
FRANK FONG (04/27/2004)
WALLACE E. FORE (06/09/2005)
ART FOSTER (06/27/2003)
MEL FOWLER (12/10/2002)
ED FRESCHL (2008 - ?)
ROBERT A. FRUSHON (06/29/2007)
CHARLES L. "CHUCK" GARDINER, JR. (12/31/2008)
WENDELL P. GARTON (10/15/2005)
GEORGE R. GEHRKENS (04/13/2003)
RICHARD C. GRISWOLD (04/08/2009)
WILLIAM H. "BILL" HAND (02/23/2005)
SHERRILL M. HANSEN (07/29/2004)
GLENN W. HARDY, JR. (08/12/2007)
VAHL E. HARRIS, JR. (03/21/200*
HELEN R. HARTBERGER (12/05/2004)
QUINTON C. HARVEY (01/28/2003)
JOHN H. HEINLEIN (06/19/2004)
WAYNE L. HEINMILLER (05/31/2002)
B. "BUZ" HELLO (02/12/2011)
DR. JOHN J. HERMAN (08/29/2006)
JOHN S. HESSELDENZ (2004)
PATTI H. HIATT (12/25/2009)
FRED J. HILL (11/11/2003)
JAMES H. HUGHES (08/27/2010)
ALFRED HUSA (08/18/2005)
HOWARD H. HUSTER (03/23/2010)
BARBARA C. "BOBBIE" JOHNSON (02/18/2005)
JIM R. JOHNSON (02/07/2004)
JULIUS A. "JULI" KANY (02/18/2009)
EDWARD "ED" KEMPER (10/20/2009)
GEORGE KINDELBERGER (03/31/2006)
DONALD L. KLITSCHE (09/29/2004)
ROBERT W. KOEPPE (05/03/2005)
GEORGE N. KOLB (11/19/2006)
PAUL LANGFELDT (12/23/2003)
CURTIS H. "CURT" LAPPEN (08/20/2010)
RAY F. LARSON (07/16/2007)
GORDON A. LEABERRY (11/16/2009)
VINCENT H. LECCESE (02/26/2004)
FRED E. LEDONNE (06/09/2004)
ALBERT C. MARTIN (03/14/2010)
RALPH E. "PETE" MAY (03/20/2002)
RALPH W. MCCLEARY, JR. (11/22/2006)
THOMAS C. MCDERMOTT, JR. (09/29/2005)
WARREN D. MCQUILLEN (10/31/2006)
MERLE F. MENEZES (11/22/2001)
LESLIE C. "LES" MEYER (02/02/2010)
WILLIAM R. MILLER (12/01/2001)
CLIFFORD R. "BOB" MINNER (2009 - ?)
CHARLES A. "CHUCK" MOORE (01/23/2004)
RICHARD A. "DICK" MORLEY (08/05/2003)
DAVID B. MULGREW (05/19/2010)
GEORGE T. MURPHY (08/13/2008)
WILLIAM E. "BILL" NELSON (2008?)
COL. JACKSON L. NUNNALLY (07/04/2010)
JACK H. OKUDA (05/07/2007)
MARIANNA OWEN (01/24/2005)
GEORGE PAPPAS (11/15/2002)
JACK P. PARKER (09/07/2008)
SHIRLEY D. PARLIER (05/09/2005)
W. GLENN PATTON (05/01/2010)
JAMES L. PEARCE (02/09/2011)
PAUL F. "PETE" PETERSON (10/23/2004)
HAROLD R. "HAL" RALEY (02/21/2005)
WILLIAM T. M. "SWAMPY" ROBERTS (12/23/2003)
AUDREY L. ROBINSON (06/23/2009)
WOODROW W. "WOODY" ROBINSON (02/29/2004)
RALPH H. RUUD (02/15/2006)
NORMAN J. RYKER, JR. (05/07/2006)
GERALD E. "JERRY" SALISBURY (2009?)
KENNETH R. "KEN" SCHELL (04/03/2007)
RICHARD G. SCHENDEN (11/09/2007)
LLOYD C. SCHMIDT (09/12/2001)
ROBERT S. SEXTON (09/05/2001)
DORIS SHORT (09/2009)
THOMAS K. SHULER (04/09/2001)
DUANE C. SILVER (07/14/2004)
CARL E. SMITH (08/25/2010)
TOD SNELGROVE (08/17/2007)
RICHARD A. "DICK" STACEY (07/24/2007)
FRANK STAGNARO (11/13/2006)
ELBERT S. STEELE (01/06/2010)
PAUL E. STEELE (03/02/2002)
WILLIAM E. "BILL" THIBODEAU (08/31/2010)
JAMES L. "JIM" THRESH (11/14/2006)
STEPHEN H. TURNER (02/18/2008)
ARTHUR R. "VAN" VAN QUEKELBERG (10/16/2006)
ARMETTA C. VANCE (06/21/2009)
SARKIS V. VARTANIAN (01/26/2005)
FRED "FREDDIE" VOILES (05/17/2006)
JOHN G. WIDENHOEFER (10/18/2006)
WILLIAM R. WIGGINS (06/06/2005)
GEORGE O. WILEY (06/29/2008)
MELVIN L. WILSON (03/03/2001)
DONALD I. ZUG (06/03/2010)

Zeroing In On The Zero

by Jim Rearden

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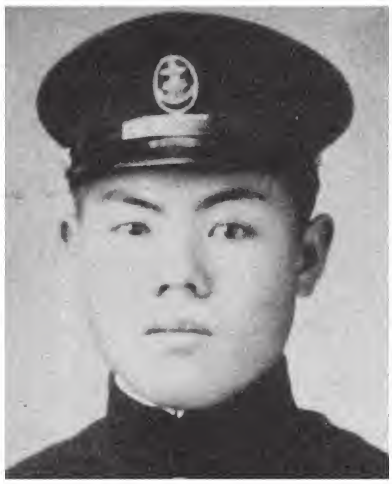
Editor's Note: This report is totally unrelated to North American Aviation. However, as is our custom, a good story deserves telling and this is a good story.

In 1941 and most of 1942, the Japanese Zero outflew virtually every enemy fighter it encountered, primarily because of its agility. Also, during the previous several years many Japanese pilots had seen aerial combat in China, so unbloodied Allied pilots in less maneuverable planes usually regretted any attempt to fight Zeros flown by the experienced Japanese—if they lived long enough.

For example, in April 1942, thirty-six Zeros attacking a British naval base at Colombo, Ceylon (now Sri Lanka), were met by about sixty Royal Air Force aircraft of mixed types, many of them already obsolete. Twenty-seven of the RAF planes went down: fifteen Hawker Hurricanes (of Battle of Britain fame), eight Fairey Swordfish, and four Fairey Fulmars. The Japanese lost one Zero.

Five months after America's entry into the war, the Zero was still a mystery to U.S. Navy pilots. On May 7, 1942, in the Battle of the Coral Sea, fighter pilots from aircraft carriers *Lexington* and *Yorktown* fought the Zero and didn't know what to call it. Some misidentified it as the German Messerschmitt Me 109.

A few weeks later, on June 3rd and 4th, warplanes from the Japanese carriers *Ryujo* and *Junyo* attacked the American military base at Dutch Harbor in the Alaskan Aleutian archipelago. The attack was intended to draw remnants of the U.S. fleet north from Pearl Harbor and away from Midway Island, where the Japanese were setting a trap. The scheme ultimately backfired when our Navy pilots sank four of Japan's first-line aircraft carriers at Midway, giving the United States a major turning-point victory.



Tadayoshi Koga was the pilot of Zero No. 4593.

In the raid on the 4th, twenty bombers blasted oil storage tanks, a warehouse, a hospital, a hangar, and a beached freighter, while eleven Zeros strafed at will. Chief Petty Officer Makoto Endo led a three-plane Zero section from the *Ryujo*, whose other pilots were Flight Petty Officers Tsuguo Shikada and Tadayoshi Koga. Koga, a small nineteen-year-old, was the son of a rural carpenter. His A6M2 Zero Model 21, Serial Number 4593, was light gray, with the imperial rising sun insignia on its wings and fuselage. It had left the Mitsubishi Nagoya aircraft factory on February 19th, only three and a half months earlier, so it was the latest design.

Shortly before the bombs fell on Dutch Harbor that day, soldiers at an adjacent Army outpost had seen three Zeros shoot down a lumbering PBY Catalina amphibian. As the plane began to sink, most of the seven-member crew climbed into a rubber raft and began paddling toward shore. The soldiers watched in horror as the Zeros strafed the crew until all were killed. The Zeros were believed to have been those of Endo, Shikada and Koga.

After massacring the Catalina crew, Endo led his section to Dutch Harbor, where it joined the other eight Zeros in strafing. It was then (according to Shikada, interviewed in 1984) that

INSIDE THE ZERO

The Mitsubishi A6M Zero was Japan's main fighter plane throughout World War II with 11,500 produced in five main variants. In March 1939, when the prototype was rolled out, the plane had to be hauled by oxcart twenty-nine miles from the Mitsubishi factory to the airfield where it flew. It represented a great leap in technology.



At the beginning of World War II, some fighters were still open cockpit, fabric-covered biplanes. In the mid-1930s, the Japanese adopted the predecessor to the Zero, a low-wing, all-metal monoplane carrier fighter. The U.S. Navy standard carrier fighter was still a biplane. The world took little notice of Japan's advanced military aircraft, so the Zero came as a great shock to the Americans at Pearl Harbor.

Lightness, simplicity, ease of maintenance, sensitivity to controls and extreme maneuverability were the main elements that the designer Jiro Horikoshi built in the Zero. The Model 21 flown by Koga weighed 5,500 pounds, including fuel, ammunition and pilot, while U.S. fighters weighed 7,500 pounds and up. Despite its large diameter 940-hp radial engine, it had the one of the slimmest silhouettes of its time. Its maximum speed was not especially fast. But speed wasn't the reason for its great combat record. Agility was! Large ailerons gave it great maneuverability at low speeds. Advanced U.S. fighters still could not turn with the Zero, but were faster and could outclimb and outdive it.

Koga's Zero was hit by ground fire. An Army intelligence team later reported, *"Bullet holes entered the plane from both upper and lower sides."*

One of the bullets severed the return oil line between the oil cooler and the engine. As the engine continued to run, it pumped oil from the broken line. A Navy photo taken during the raid shows a Zero trailing what appears to be smoke. It is probably oil, and there is little doubt that this was Zero No. 4593.

After the raid, as the enemy planes flew back toward their carriers, eight American Curtiss P-40 Warhawks shot down four Val (Aichi D3A) dive bombers thirty miles west of Dutch Harbor. In the swirling, minutes-long dogfight, Lieutenant John J. Cape shot down a plane identified as a Zero.

Another Zero was almost instantly on his tail. He climbed and rolled, trying to evade, but those were the wrong maneuvers to escape a Zero. The enemy fighter easily stayed with him, firing its two deadly 20 mm cannon and two 7.7 mm machine guns. Cape plunged into the sea. Another Zero shot up another P-40 flown by Lieutenant Winfield McIntyre, who survived the crash, landing with a dead engine.

Endo and Shikada accompanied Koga as he flew his oil-spewing airplane to Akutan Island, twenty-five miles away, which had been designated for emergency landings. A Japanese submarine stood nearby to pick up downed pilots. The three Zeros circled low over the green, treeless island. At a level, grassy valley floor half a mile inland, Koga lowered his wheels and flaps and eased toward a three-point landing. As his main wheels touched, they dug in, and the Zero flipped onto its back, spewing water, grass, and gobs of mud. The valley floor was a bog, and the knee-high grass had concealed the water.

Endo and Shikada circled. There was no sign of life. If Koga was dead, their duty was to destroy the downed fighter. Incendiary bullets from their machine guns would have done the job. But Koga was a friend, and they couldn't bring themselves to shoot. Perhaps he would recover, destroy the plane himself, and walk to the waiting submarine. In fact, Koga was dead. His neck had been broken when the aircraft flipped over.

Endo and Shikada abandoned the downed fighter and returned to the *Ryujo*, two hundred miles to the south (the *Ryujo* was sunk two months later in the eastern Solomons by planes from the aircraft carrier *Saratoga*). Endo was killed in action at Rabaul on October 12, 1943, while Shikada survived the war and eventually became a banker.

The wrecked Zero lay in the bog for more than a month, unseen by U.S. patrol planes and offshore ships. Akutan is often foggy, and constant Aleutian winds create unpleasant turbulence over the rugged island. Most pilots preferred to remain over water, so planes rarely flew over Akutan. However, on July 10, a U.S. Navy PBY Catalina amphibian returning from overnight patrol crossed the island. A gunner named Wall called out, *"Hey, there's an airplane on the ground down there. It has meatballs on the wings."* That meant the rising-sun insignia.

The patrol plane's commander, Lieutenant William Thies, descended for a closer look. What he saw excited him. Back at Dutch Harbor, Thies persuaded his squadron commander to let him take a party to the downed plane. No one then realized that it was a Zero.

Ensign Robert Larson was Thies's copilot when the plane was discovered. He remembers reaching the Zero. *"We approached cautiously, walking in about a foot of water covered with grass.*



Zero No. 4593 is inspected by U.S. Navy personnel on Akutan Island on July 11, 1942.

Koga's body, thoroughly strapped in, was upside down in the plane, his head barely submerged in the water.

"We were surprised at the details of the airplane," Larson continues. *"It was well built, with simple, unique features. Inspection plates could be opened by pushing on a black dot with a finger. A latch would open, and one could pull the plate out. Wingtips folded by unlatching them and pushing them up by hand. The pilot had a parachute and a life raft."*

Koga's body was buried nearby. In 1947, it was shifted to a cemetery on nearby Adak Island, and later, it is believed, his remains were returned to Japan.

Thies had determined that the wrecked plane was a nearly new Zero, which suddenly gave it special meaning, for it was repairable. However, unlike U.S. warplanes, which had detachable wings, the Zero's wings were integral with the fuselage. This complicated salvage and shipping.

Navy crews fought to free the airplane out of the bog. The tripod that was used to lift the engine, and later the fuselage, sank three to four feet into the mud. The Zero was too heavy to turn over with the equipment on hand, so it was left upside down while a tractor dragged it on a skid to the beach and a waiting barge. At Dutch Harbor, it was turned over with a crane, cleaned, and crated, wings and all.

When the awkward crate containing Zero No. 4593 arrived at North Island Naval Air Station, San Diego, a twelve-foot-high stockade was erected around it inside a hangar. Marines guarded the priceless plane while Navy crews worked around the clock to make it airworthy. (There is no evidence the Japanese ever knew we had salvaged Koga's plane.)

In September, Lieutenant Commander Eddie R. Sanders studied it for a week as repairs were completed. Forty-six years later he clearly remembered his flights in Koga's Zero. *"My log shows that I made twenty-four flights in Zero No. 4593 from 20 September to 15 October 1942,"* Sanders told me. *"These flights covered performance tests such as we did on planes undergoing Navy tests. The very first flight exposed weaknesses of the Zero that our pilots could exploit with proper tactics.*

"The Zero had superior maneuverability only at the lower speeds used in dogfighting, with short turning radius and excellent aileron control at very low speeds. However, immediately apparent was the fact that the ailerons froze up at speeds above two hundred knots, so



U.S. Navy Lieutenant Commander Eddie Sanders taxis the repaired Zero fighter at Naval Air Station San Diego, California in September 1942.

that rolling maneuvers at those speeds were slow and required much force on the control stick. It rolled to the left much easier than to the right. Also, its engine cut out under negative acceleration, as when nosing into a dive, due to its float-type carburetor.

"We now had an answer for our pilots who were unable to escape a pursuing Zero. We told them to go into a vertical power dive, using negative acceleration, if possible, to open the range quickly and gain advantageous speed while the Zero's engine was stopped. At about two hundred knots, we instructed them to roll hard right before the Zero pilot could get his sights lined up.

"This recommended tactic was radioed to the fleet after my first flight of Koga's plane, and soon the welcome answer came back: 'It works!' " Sanders said, satisfaction sounding in his voice even after nearly half a century. Thus, by late September 1942, Allied pilots in the Pacific theater knew how to escape a pursuing Zero.

"Was Zero No. 4593 a good representative of the Model 21 Zero?" I asked Sanders. In other words, was the repaired airplane 100 percent?

"About 98 percent," he replied.

The Zero was added to the U.S. Navy inventory and assigned its Mitsubishi serial number. The Japanese colors and insignia were replaced with those of the U.S. Navy and later the U.S. Army, which also test-flew it. The Navy pitted it against the best American fighters of the time-the Lockheed P-38 Lightning, the Bell P-39 Airacobra, the North American P-51 Mustang, the Grumman F4F-4 Wildcat, and the Chance Vought F4U Corsair-and for each type developed the most effective tactics and altitudes for engaging the Zero.

In February 1945, Commander Richard G. Crommelin was taxiing Zero 4593 at San Diego Naval Air Station, where it was being used to train pilots bound for the Pacific war zone. A Curtiss SB2C Helldiver overran it and chopped it up from tail to cockpit. Crommelin survived, but the Zero didn't. Only a few pieces of Zero No. 4593 remain today. The manifold pressure gauge, the air-speed indicator, and the folding panel of the port wingtip were donated to the Navy Museum at the Washington Navy Yard in Washington, D.C. by Rear Admiral William N. Leonard, who salvaged them at San Diego in 1945. In addition, two of its manufacturer's plates are in the Alaska Aviation Heritage Museum in Anchorage, donated by Arthur Bauman, the photographer.

Leonard recently told me, *"The captured Zero was a treasure. To my knowledge no other captured machine has ever unlocked so many secrets at a time when the need was so great."* A somewhat comparable event took place off North Africa in 1944. A squadron commanded by Captain Daniel V. Gallery, aboard the escort carrier Guadalcanal, captured the German submarine U-505, boarding and securing the disabled vessel before the fleeing crew could scuttle it. Code books, charts, and operating instructions rescued from U-505 proved quite valuable to the Allies. Captain Gallery wrote, *"Reception committees which we were able to arrange as a result... may have had something to do with the sinking of nearly three hundred U-boats in the next eleven months."* By the time of U-505's capture, however, the German war effort was already starting to crumble (D-Day came only two days later), while Japan still dominated the Pacific when Koga's plane was recovered.

A classic example of the Koga plane's value occurred on April 1, 1943, when Ken Walsh, a Marine flying a Chance Vought F4U Corsair over the Russell Islands southeast of Bougainville, encountered a lone Zero. *"I turned toward him, planning a deflection shot, but before I could get on him, he rolled, putting his plane right under my tail and within range. I had been told the Zero was extremely maneuverable, but if I hadn't seen how swiftly his plane flipped onto my tail, I wouldn't have believed it,"* Walsh recently recalled.

"I remembered briefings that resulted from test flights of Koga's Zero on how to escape from a following Zero. With that lone Zero on my tail I did a split S, and with its nose down and full throttle my Corsair picked up speed fast. I wanted at least 240 knots, preferably 260. Then, as prescribed, I rolled hard right. As I did this and continued my dive, tracers from the Zero zinged past my plane's belly.

"From information that came from Koga's Zero, I knew the Zero rolled more slowly to the right than to the left. If I hadn't known which way to turn or roll, I'd have probably rolled to my left. If I had done that, the Zero would likely have turned with me, locked on, and had me. I used that maneuver a number of times to get away from Zeros."

By war's end, Capt. Kenneth Walsh had twenty-one aerial victories, seventeen Zeros, three Vals, and one Pete, making him the war's fourth-ranking Marine Corps ace. He was awarded the Medal of Honor for two extremely courageous air battles he fought over the Solomon Islands in his Corsair during August 1943. He retired from the Marine Corps in 1962 after more than twenty-eight years of service. Walsh holds the Distinguished Flying Cross with six Gold Stars, the Air Medal with fourteen Gold Stars, and more than a dozen other medals and honors.

How important was our acquisition of Koga's Zero in flyable condition? Masatake Okumiya, who survived more air-sea battles than any other Japanese naval officer, was aboard the *Ryujo* when Koga made his last flight. He later co-authored two classic books, *"Zero and Midway"*. Okumiya wrote that the Allies' acquisition of Koga's Zero was *"no less serious"* than the Japanese defeat at Midway and *"did much to hasten our final defeat."*

Editor's Note: This is a condensed version of the Zero narrative originally written by Jim Rearden. A forty-seven-year resident of Alaska, Jim is the author of fourteen books and more than five hundred magazine articles, mostly about Alaska. Among his books is "Koga's Zero: The Fighter That Changed World War II". *Although, the article has no connection to North American Aviation, the Zero was one of the outstanding fighter aircraft that rose to challenge the P-51 Mustangs escorting B-29 bombers over Japan. It was always a plane to be reckoned with.*

Congratulations and Best Wishes to

Larry and Mary Kathryn Larsen of Chester, California
celebrating their 72nd Wedding Anniversary

James and Arline Hollen of Thousand Palms, California
celebrating their 68th Wedding Anniversary

Francis and June Underwood of Beavercreek, Ohio
celebrating their 66th Wedding Anniversary

John and Ruth McMullen of Hamilton, Montana
celebrating their 60th Wedding Anniversary

Ed "Moke" and Joann Mokslaveskas of Valley Village, California
celebrating their 60th Wedding Anniversary

Fred and Lynn Zimmerman of Indio, California
celebrating their 60th Wedding Anniversary

Thomas and Shirley Maney of West Hills, California
celebrating their 55th Wedding Anniversary



U.S. Navy Photo

A three-quarter aerial view of an RA-5C Vigilante aircraft, Reconnaissance Attack Squadron 7 (RVAH-7) known as the "Peacemakers of the Fleet" and was assigned to the* USS Ranger *(CV-61) from February 21 to September 22, 1979. This photograph may show the Vigilante's last flight, since all Vigilante aircraft were officially retired in September 1979 and RVAH-7 was officially decommissioned in October 1979.

Contrails From The Past

by Ed Rusinek

Dear Mr. Rusinek,

From the day I was born until the day I graduated from high school, my father, Bert Richard, was an NAA/Rockwell employee. I guess that makes me an NAA/Rockwell "brat". Dad worked at the Downey plant from the early Sixties to 1974. Then we moved to Lancaster where he worked on the Space Shuttle from '74 to '92.

I never stepped foot in the Downey facility but sometimes Mom would take me to pick up Dad. On the Imperial Boulevard side I could see the giant "swing set" that dropped Apollo boilerplates into the landing impact pool. I could also see several Apollo boilerplates sitting there like white teepees in a Sioux Indian camp. Oh, how I dreamed of going in there and playing with that stuff!

My fondest memories, however, are of the early days of Shuttle program and the B-1A. I was privileged to witness the arrival of the OV-10 mid-fuselage, the first flight of the B-1, the OV-10 rollout ceremony, the OV-10 overland journey from Plant 42 to Edwards AFB, the first Approach and Landing Test (ALT) of Enterprise, a thrilling ALT separation right over my school during recess, a nice chat with Bob Crippen and seeing all six orbiters under construction at Plant 42.

In those days, it seemed that life revolved around NAA/Rockwell. Most of my friends and schoolmates were aerospace "brats" like me. My Mom, Joan, even got into the action by working on the Shuttle and the B-1. The whole experience inspired me to join the Air Force after high school.

Reading the NAAR Bulletin has brought back some great memories of those days in Lancaster. I've enjoyed the articles about the B-1, Apollo and Shuttle. I've read many books about airplanes and spacecraft over the years, but the articles in the Bulletin are some of the best I've ever read. I look forward to reading more. My best wishes to you and the fine publication you oversee.

—Donald F. Richard, Sherwood, OR

Ed's Ans.: It is obvious that your Mom and Dad did a great job in raising you. This country can use many more "brats" like you. God bless you and all the things you do!

Dear Ed,

Two years ago, my friend Jack Browning, gave me an issue of the Retirees Bulletin. I subscribed for two years. The Bulletin has brought back so many memories of the people and the programs that we worked on during "Working Days" at LAD, Columbus and, finally, the Space Division (KSC).

This time, I would like to become a Silver Eagle. Keep up the good work!

—Don Vogelbacher, Titusville, FL

Ed's Ans.: There are only five of us that have been putting out the Bulletin for the past ten years. We are volunteers so there is no monetary reward. However, a letter like yours makes it all worthwhile.

The Pleasure of Your Company Is Requested at the 49th Bald Eagles Reunion to be held on Saturday, April 30, 2011 at the Proud Bird Restaurant 11022 Aviation Blvd. (at 111th Street) Los Angeles, CA

Attendance Cost: $30.00 with Advance Reservation
$33.00 at the Door – Name Badges and Meal Tickets Given at Door

Doors Open for Social at 10:00 A.M.
Seating for Luncheon at 12:00 Noon

The Honorary Speaker will be Ralph Wetterhahn. He is a modern day "Indiana Jones", scouring the far corners of the world for missing aircraft and, more importantly, Americans lost in combat. In Vietnam, he flew for both the Air Force and the Navy. He is a great speaker and a great American!

The meal choices are Prime Rib, Chicken or Vegetarian. Please indicate your choice on your check. Please make your checks payable to the Bald Eagles, Inc. and send them to:

Cathy Baker, Bald Eagles, Inc.
16372 Lakemont Lane
Huntington Beach, CA 92674
Phone: (714) 847-1678

Want to sit with your friends? Organize a group of eight and order tickets in one batch! Have no friends? Come anyway and make new friends!

The Silent Majority

by Stan Guzy



COMPTON, FRANK G., 90 – passed away on January 15, 2011 in Torrance, CA. After attending the Colorado School of Mines and completing a stint with the National Guard where he learned to fly and serve on an Air Guard NAA 0-47, he accepted a drafting position at LAD in 1940. Preparing drawings and technical reports in support of the NA73/83 British Mustang, he found his "niche" originating new design concepts. In early 1944, he left to serve in the U.S. Navy as a flight engineer on PBM-5 long-range patrol planes. Returning to his Preliminary Design Specialist position, he was assigned to the FJ-1 Navy fighter program and the XAJ-1 carrier-based nuclear bomber proposal. He transferred to the Columbus Division as Chief Preliminary Designer and later Manager of Advanced Systems. During the next four years, his team captured the A3J-1/RA-5 Attack Bomber, the T2J Jet Trainer and the FJ-4 Fighter programs. In 1960, Frank returned to the West Coast as Vice President of Advanced Programs Development at the Space and Information Systems Division in Downey. Finally, in 1966, he joined the Autonetics Division as Vice President-General Manager, Ocean Systems Operations. He left in 1970 with 30 years of outstanding service to join Wally Schirra's ECCO Corporation as President and Chief Operating Officer. Frank was a good resource and a splendid adviser to the Bulletin. We shall miss you, Old Friend!

PEARCE, JAMES L. "JIM", 91 – passed away in Palm Bay, FL on February 9, 2011. After distinguished service as a Navy combat pilot during WWII, Jim joined LAD in 1950 as an engineering test pilot and was transferred to the new Columbus Division in 1951 as Chief Engineering Test Pilot and Manager of of Engineering Flight Test. He remained at Columbus until 1961 when he transferred to the S&ID Division at KSC as Director of Test and Operations for the Apollo Command and Service Modules. He left NAA after the Apollo 1 fire and was very successful in several business ventures of his own. Jim was given more than his share of life's burdens and managed to overcome them all, not in anger, but in accomplishment. He was our friend.

BANTLY, JAMES E. 'KING", 84 – passed away in Norco, CA on June 5, 2010. A WWII Navy veteran, Jim retired from Space Division as manager of the Hydraulics Engineering Group with 30 years of service.

BODY, LAWRENCE G. "LARRY", 85 – of Orange, CA passed away on November 25, 2010 due to complications from Leukemia. Larry served in the U.S. Navy for 22 years as a deck officer and a naval aviator. Retiring with the rank of Lieutenant Commander, he held two degrees from MIT and the U.S. Navy Post Graduate School. He joined Space Division and had 16 years of service on the Space Shuttle before going on to serve on the B-2 program. He is survived by his loving wife of 62 years, Virginia. Internment was at the National Cemetery in Riverside. Larry was a good and gentle friend and he will be sorely missed.

BORGER, JOHN "JACK", 86 – of Montague, CA passed away on May 14, 2010. Jack was a supervisor in Manufacturing Electrical/Mechanical Installation on the Apollo and Space Shuttle programs at Space Division. He retired in 1983 with 36 years of service. He was predeceased by his loving wife, Gerry. She also served at Space Division as a secretary in Quality Assurance.

CEJDA, RUSSELL F., 73 – of Merritt Island, FL passed away on December 28, 2010. Russ served as a Quality manager at NAA-Rockwell at KSC on the Apollo and Shuttle programs. He is survived by his wife Dawn.

COLLACOTT, THOMAS L., SR., 84 – of Westminster, CA passed away on November 9, 2010. A WWII veteran, Tom had a distinguished career as a Proposal/Pricing/Negotiator. He retired from Autonetics in 1988 with 27 years of service. He is survived by his wife Karen.

DOMINGUEZ, JOSEPHINE H. "JOSIE", 83 – passed away peacefully at home on November 4, 2010 in Yorba Linda, CA. Josie was a woman ahead of her time. She retired from Rockwell International as a manager of Data Processing with 34 years of service.

DREYER, GEORGE W., – of Murrieta, CA passed away on January 21, 2011. Over the years, George survived many medical issues but now is at rest. He retired from the Strategic Systems Division in 1990 with 32 years of service.

EDDLEMAN, THOMAS N., 84 – passed away in Orange, CA on October 24, 1010. After serving in the USAF, Tom came to NAA in 1950 and started building P-51 Mustang fighters, T-6 trainers, and later, Space Vehicles. He retired in 1977 with 26 years of service. Tom was predeceased by his wife of 51 years, Ursula.

GRIMES, FREDRIC A. "FRITZ", 81 – of Huntington Beach, CA succumbed peacefully in his sleep on January 10, 2011. Fritz was a unique gentleman, remembered for his wit, literacy, artistic talent and generosity. After serving with the USAF in Korea, he graduated from USC *summa cum laude* and joined Capitol Records. His later career in aerospace brought him to Space Division as a technical documentation specialist on the Apollo. He, subsequently, had a similar assignment on the B-1 and B-1B programs at the B-1 Division. He retired in 1985 with 22 years of service.

HALL, ROBERT J. "JIM", 90 – passed away in Hemet, CA on November 17, 2010. Jim served in the Navy during World War II as an Aviation Machinist's Mate First Class on the island of Guam, overseeing the repair of fighter aircraft. He joined NAA and served for 45 years, retiring as General Manager of Purchasing. He is survived by his wife of 68 years, Theresa.

HANNON, CHARLES P., SR., 82 – of Cocoa Beach, FL, died on January 27, 2011 after a sudden heart attack. His Navy V-5 unit at Stevens Institute was called up to serve in the closing days of WWII. He completed his B.S. degree at the University of Alabama and was again called up to serve as an officer in the U.S. Air Force. Stationed at Patrick Air Force Base led to the rocket development program at North American Aviation in Downey. He transferred to NAA at Cape Canaveral as a flight test engineer, first on Navaho and

Hound Dog, later on Apollo and Skylab. Retiring from NAA-Rockwell, he joined Lockheed as a launch director for the Shuttle program. Charles is survived by his wife Elizabeth.

HILLARY, GARRETT "GARY", 89 – of Winter Park, FL, lost his battle with cancer on October 22, 2010. Although Gary earned a civilian pilot license, he was denied a flying career in the U.S. Army Air Forces due to a childhood injury and became a B-17 maintenance officer in Rattlesden, England with the 8th Air Force. After World War II, Gary joined LAD as a draftsman. His 35-year career with Field Service took him to Japan and Washington, D.C. He retired as Director of the NAR Washington, D.C. Office. Gary is survived by his loving wife of 67 years, Betty.

JEANPLONG, THOMAS "TOM", 77 – passed away in Fallbrook, CA on September 12, 2010 of pancreatic cancer. Tom served in the planning department on the Apollo in Downey and the B-1 at the LAD facility. He retired in 1989 with 37 years of service. Tom is survived by his loving wife Helen.

JENSEN, DANIEL H., 80 – passed away on January 27, 2011. After serving in the USAF and getting a degree from the University of Michigan, Dan joined NAA/RI. He was the Command Module test chief on the Apollo Program and subsequently helped develop, build and test the world's first reusable spaceship, the Shuttle. He retired with 30 years of service and is survived by his wife Lois.

LAMKINS, ALBERT U. "AL", 81 – of Anaheim, CA passed away on November 22, 2010 of complications from pneumonia. Al came to NAA at Downey in 1955 where he performed the Environmental Qualification Test on the F-86 and the Navaho. He transferred to Autonetics where he completed 33 years of service when he retired in 1988. Al symbolized the work ethic and integrity on which the company was founded. A very positive individual, he enjoyed organizing the yearly December Flight Control luncheons for which he will always be remembered.

LEONARD, JOHN P., 80 – of Evans, GA, passed away on November 1, 2010 in Jacksonville, FL. John served in the USAF during the Korean War. He was an NAA field rep supporting the OV-10A and RA-5C aircraft at several foreign and domestic bases. During his 33 years of service, he was also the resident rep at NARF Jacksonville, FL and the Marine Corps base at Jacksonville, NC. He is survived by his wife Bernice.

LUZIO, JOHN A., 87 – passed away on September 24, 2010 in Newark, OH. During WWII, John served aboard the Destroyer Escort *USS Tomich* in both the Atlantic and Pacific theaters. He joined NAA on the Saturn V and Space Shuttle programs as a production planner. He is survived by his wife of 62 years, Norma.

MEYER, ROY, 91 – died peacefully at home in Lomita, CA on November 19, 2010. Roy came to LAD in 1948 and served for 35 years before he retired. He is survived by his wife of 68 years, Floy.

O'BRIEN, WALLACE LEE, 84 – passed away in Albuquerque, NM on July 10, 2010. Wallace served as an engineer for 40 years at LAD when he retired in 1991. He is survived by his loving wife of 61 years, Ruth Lucile.

PENNER, GLENN E., 88 – of Torrance, CA passed away on January 27, 2011. Glenn retired as a Quality Assurance manager from LAD in 1979 with 38 years of service. He is survived by his loving wife of 68 years, Betty.

PETERSEN, MILTON B., 78 – of Rossmoor, CA passed away on December 17, 2010. He obtained his degree at Washington State University and joined NAA/RI as an engineer until his retirement in the 1990s. He was preceded in death by his wife, Gwen.

REDER, JOE, 87 – succumbed in Richland, WA, after a long battle with cancer. Joe served at Space Division for 17 years on the Apollo and Shuttle programs before transferring to the Rockwell Hanford facility as an engineering manager. He retired in 1997 with 35 years of service. Joe is survived by his loving wife Linda. Joe left a final message, *"Thanks NAA for all the good times and wonderful friendships."*

SELL, CHARLES L. "CHUCK", 89 – passed away peacefully at home in Colorado Springs, CO on December14, 2010. During WWII, Chuck served in the Pacific as a much decorated Marine Corps fighter pilot. He was called up again to serve in Korea. Getting a B.S. degree from the University of Wisconsin, he came to LAD in 1950 and served there for 35 years before retiring in 1986 as Director of Customer Relations, LAD. Chuck was the president of the National Defense Industrial Association in Los Angeles and was a major planner and participant in the yearly Paris and Farnborough Air Shows. He is survived by his loving wife of 24 years, Joan. Chuck was considered the classic epitome of a gentleman.

WATKINSON, DONALD E., 82 – of Cottage Grove, OR passed away on October 24, 2010. Don began as a machinist at Rocketdyne and advanced to engineer, serving on many programs including Atlas, Delta, Apollo, Water Jet and several experimental projects. He retired in 1986 with 31 years of service. He is survived by his loving wife of 58 years, Marilyn.

ZINSLEY, WILLIAM, – passed away peacefully at home in Manhattan Beach, CA on January 10, 2011. He had served for 30 years on the Shuttle and B-1 programs in the Non-Metallic segment of the Materials & Processing Laboratory at LAD when he retired in 1980. Bill is survived by his loving wife of 50 years, Fran.

A LOST SHEEP HAS BEEN FOUND!

When Gary Oderkirk of faroff Blain, Washington was reported missing, we received word from Bill Bright that Gary only moved to another part of town.

He was lost, but now he is found. Allelujia!

LOST SHEEP – BULLETIN RETURNED WITH NO FORWARDING ADDRESS

WILLIAM N. CONRAD – TEMECULA, CA

CHUCK MILOSEVICH – YORBA LINDA, CA

ARTHUR A. RIES – NORWALK, CA

GEORGE K. SIMMONS – OCEANSIDE, CA

FRANK ZELINSKI – LAKEWOOD, CA

PAX DOMINI SIT SEMPER VOBISCUM

NORTH AMERICAN AVIATION
RETIREES BULLETIN
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North American Aviation Retirees Bulletin
"Where The Best Never Rest"

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NASA/Bill Ingalls Photo
The search and recovery forces found the charred Soyuz TMA-18 Descent Module after it returned to Earth on September 25, 2010, landing by parachute on the vast plains of Central Kazakhstan near the city of Arkalyk. Departure from the International Space Station was delayed one day due to failure of a sensor that prevented hooks on the Poisk side of the docking interface from opening.

NORTH AMERICAN AVIATION
Retirees Bulletin
"Where The Best Never Rest"

Summer 2011

RECIPIENTS OF THE NORTH AMERICAN AVIATION 2011 OUTSTANDING ACHIEVEMENT AWARDS



Cadet Jared D. Becker
Excellence in Aeronautics

Cadet Joseph J. Boben
Excellence in Basic Research



Cadet Dylan Asmar
Excellence in Astronautics

Cadet Candidate Calvin P. Llarena
Excellence in the U.S. Air Force Academy Preparatory School

NORTH AMERICAN AVIATION
Retirees Bulletin

North American Aviation Retirees Bulletin, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

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Dear NAA Retirees Bulletin Subscriber

Someone said that North American Aviation no longer exists! It is not dead because we, the North American Aviation Retirees Bulletin Staff, are still here and every three months we unfurl our colors and charge forward with some great stories of our NAA past. This issue is no exception! Our *Pièce de Résistance* is a debriefing Lieutenant George S. Welch gave on May 19, 1942, five months after the attack on Pearl Harbor. This document was discovered by a history buff, Mr. Walter Beachell of Hockessin, Delaware, in the National Archives located at Maxwell Air Force Base in Alabama. Mr. Beachell is a financial analyst with no professional connection to aviation. However, he is an avid researcher and was a good friend of Ed Horkey.

Your Bulletin now has a Speakers Bureau consisting of Larry Korb. We arranged for a four-day visit by him to the U.S. Air Force Academy in Colorado Springs. He was warmly greeted by the leadership from the Aeronautics and Astronautics departments and addressed joint sessions of cadets from both departments. He was also introduced to a "brown bag" joint session of both faculties and a quiet dinner with the leadership of the Academy. The theme of his speech was *"Lessons Learned From the Manned Space Program"*. He also gave a separate oration, *"Standing on the Shoulders of Giants"*, to the local AIAA groups at the University of Colorado, Colorado Springs. He was given an outstanding tour of the laboratories and test sites, capped by a lunch with 4,500 cadets in their huge dining room. Since we are aware that some of our more frugal readers are concerned that their $15 subscription was used to finance this splendid venture, let us add that Larry picked up his own travel expenses. We only provided him with the invitation and a prayer for his safe travel.

In this issue we introduce you to a new author, Colonel Matthew Wallace, USAF (Ret). He flew many combat missions during the Vietnam War in the F-100D and F-4E. Here, he describes his first lesson learned, landing the F-100 safely and without damage to the aircraft. We hope to have him return in later issues with the experiences he encountered with the F-100D in Vietnam.

Cleve Kimmel is back with another penetrating analysis. This time it is the F-100 Fuel System test that required the test pilot to perform a very dangerous test dive with little chance of survival if the airplane failed.

If you missed the Bald Eagles 49th Reunion last April 30th, you missed a splendid affair! Some of the old timers did not come but we saw quite a few new faces. Several brought their ladies and it provided a more gracious atmosphere to the event. The guest speaker, Ralph Wetterhahn, gave an excellent presentation on his search for missing airmen throughout the far corners of the world.

Prior to his address, the Bulletin provided a status report reflecting on our unceremonious exit from Boeing and our ability to survive and thrive these past 11 years. Not only thrive, but institute four yearly endowments for perpetuity, recognizing outstanding graduating cadets at the Air Force Academy. No other aerospace company is represented to this level of participation! This year, our good friend, Lt. Col. John Swanson, U.S. Army Reserve, returned and represented North American Aviation at the Prep School graduation award ceremony. Our own John Sandford represented North American Aviation at the Astronautics and Aeronautics ceremonies. John was very warmly received by administrative leaders and faculty members and treated to an informal social at the Colorado Mountain Brewery the evening before making the award presentations. John also paid for his own travel expenses. The Bulletin has always been blessed that whenever a situation arises, there is always someone who steps forward and provides that extra push that assures success! We are grateful to all of them!

Several weeks ago, an excited daughter called to report that her father passed away and his last wish was to have his death reported in the Silent Majority. While we spoke, I looked through our subscription list and did not find his name. I expressed surprise that he would be so determined to be mentioned in the Silent Majority when he wasn't even a subscriber. She blurted out, *"Oh! He didn't care for the Bulletin!"* There was an awkward moment when you could sense the "OOPS! I just said the wrong thing!" I assured her that whatever his personal feelings were about the Bulletin did not matter. Everyone—whether President of NAA or janitor of NAA—is NAA Family and will be afforded the same due respect in the Silent Majority. Naturally, we would rather have a live subscriber than another notice of the passing of an NAA Retiree, but that is Life!—Or was!

That Morning at Pearl Harbor

by Lieutenant George S. Welch

Note: The Editors are aware the following transcript contains a term which could be offensive to some readers. However, to retain the report's historic integrity, we elected to retain its original wording. It is never our intent to insult anyone's heritage. At the time of the Pearl Harbor attack, the Japanese Navy pilots were probably the best trained and experienced in the world, not to mention the best equipped.

I have been stationed at Wheeler Field since February 21, 1940, leaving there May 14, 1942, reporting to Washington, War Department, A-2.

On December 7th, 1941, I was awakened by the sound of dive bombers peeling off about eight o'clock in the morning. I thought they were Navy dive bombers... so I stayed in bed until I heard bombs exploding and machine gun fire. With about three or four other officers from the Club, where I stayed, I ran out—saw red circles on the airplanes and realized what was going on and that they were Jap planes.

Lieutenant Taylor and I remembered that we had airplanes at Haleiwa, so we jumped into Lieutenant Taylor's car and drove out there. We got out there and the Fighter Command called us and requested us to take any pursuit we had and take off and proceed to Barber's Point at 8,000 feet. There were two of us there then—we took off and didn't see anything except a fire at Pearl Harbor.

Later we noticed twenty or thirty airplanes in a traffic pattern at Ewa, the Marine Landing Field. We found they were Japanese dive bombers strafing the field. Lieutenant Taylor and I each shot two of those down. I was leading and peeled off first. Lieutenant Taylor was about 200 yards to the rear and side, following me. Their rear gunner was apparently shooting at the ground—because they did not see us coming. The first one I shot down, the rear gunner didn't even turn around to face me. I got close enough to see what he was doing. I got him in a five second burst—he burned up right away.

I left him and got the next plane in a circle which was about one hundred yards ahead of him. His rear gunner was shooting at me. One bullet put a hole through my cooling radiator, and I got one in my prop and one in the nose. It took about three bursts of five seconds each to get him. He crashed on the beach.

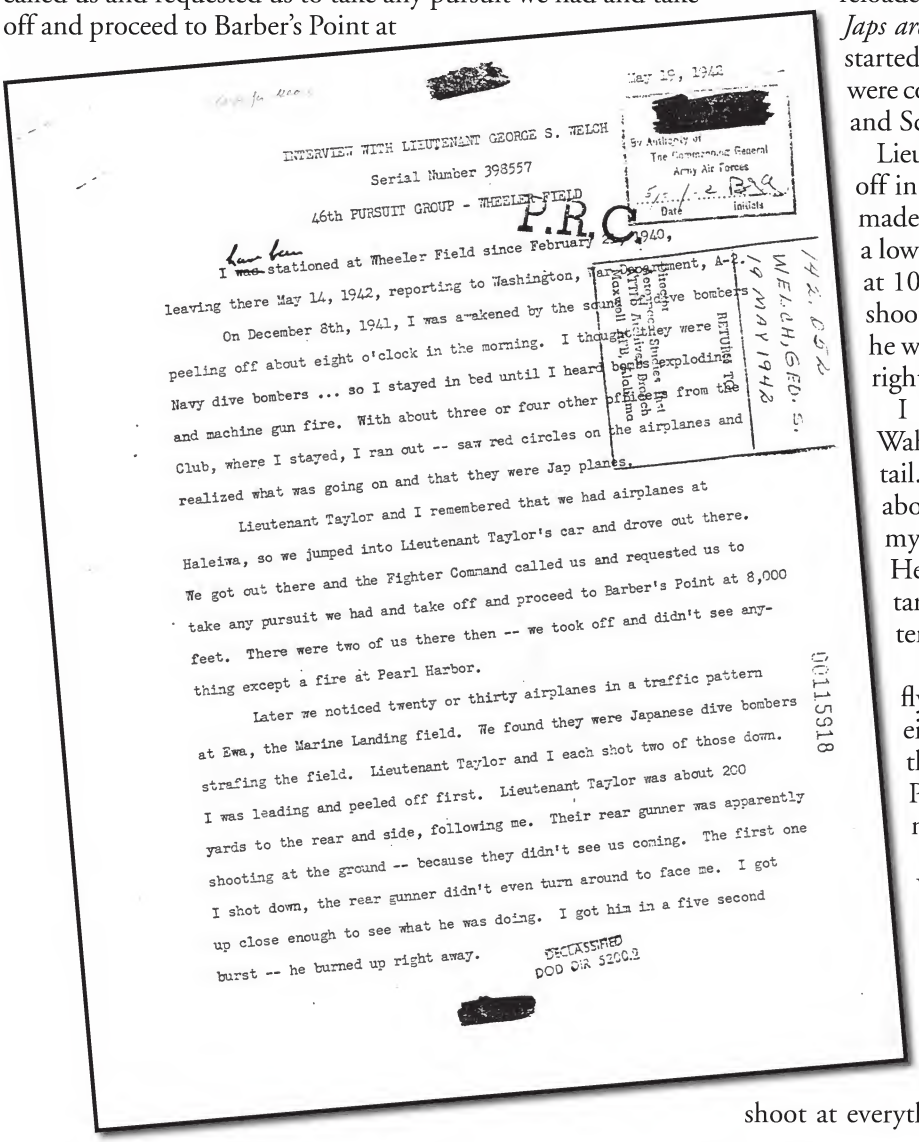
In the meantime, the rest of the dive bombers had disappeared. We didn't know where—so Lieutenant Taylor and I went back to Wheeler Field and landed. We refueled and reloaded right away. The enlisted men screamed, *"The Japs are coming back again!"* We just got our motors started when the Japs started strafing the field. They were coming from Pearl Harbor towards Wheeler Field and Schofield Barracks.

Lieutenant Taylor took off down the field and I took off in the opposite direction, flying into the Japs. I made a full throttle climb for about three minutes in a low turn to the left. I climbed 3,000 feet a minute at 105 or 110 miles an hour. A Jap was on my tail shooting at me. I could see his tracers going by—but he was either too far back or his gun wasn't working right. I shook him off—outclimbing him.

I saw Lieutenant Taylor on one Jap's tail over Wahiawa and another Jap on Lieutenant Taylor's tail. I dove on this one while I was about 1,000 feet above him and a mile behind. I had to put down my flaps to slow down to keep behind the Jap. He burst into flame. Apparently, I hit the big gas tank between the pilot and the gunner. He had a terrific explosion right there and crashed.

I flew back over Ewa and saw one Jap plane flying around all by himself. His rear gunner was either dead or asleep for I didn't get fired at. I shot the plane down right on the beach off Barber's Point. I then flew around for fifteen or twenty minutes and then went back to Haleiwa.

When I looked down the hangar line at Wheeler Field, there were obviously very few, if any, airplanes left. They were all burning or scattered bombs had hit them and scattered them all over the place. The Japs came down parallel to the hangar line in a string. They dive bombed within twenty feet of the ground very slowly—at very low speed. The pilot would shoot at everything he saw and the rear gunner would spray



May 19, 1942

[redacted]
By Authority of
The Commanding General
Army Air Forces
5/5/42 BAG
Date Initials

P.R.C.

INTERVIEW WITH LIEUTENANT GEORGE S. WELCH
Serial Number 398557
46th PURSUIT GROUP - WHEELER FIELD

I ~~was~~ stationed at Wheeler Field since February 21, 1940, leaving there May 14, 1942, reporting to Washington, War Department, A-2.

On December 8th, 1941, I was awakened by the sound of dive bombers peeling off about eight o'clock in the morning. I thought they were Navy dive bombers ... so I stayed in bed until I heard bombs exploding and machine gun fire. With about three or four other officers from the Club, where I stayed, I ran out -- saw red circles on the airplanes and realized what was going on and that they were Jap planes.

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everything as they went by. About half of them had fixed landing gear. They were all in open positions. They flew a regular traffic around the field. They never got more than 100 or 200 feet high. I imagine that there were thirty planes in this pattern strafing Wheeler Field. They flew around with their pattern to the right. When they returned, they used the same formation and signals that we do—shallow left turn, wiggling the wings. They would come back into formation, peel off and come down again. There was no resistance from Wheeler Field at all, so that they had a perfect pattern, and could pick out individual ships that they could see weren't on fire and shoot at them with both their 7.7s and 20 mm cannon.

I thought that about 50% of the dive bombing was very accurate. One or two pilots made large misses—100 yard misses from very low altitude. The air discipline was excellent. Their formation work was much better than anything the Army Air Corps does. Apparently, the pilots had been flying in Manchuria, for in the planes that were shot down, the pilots had Manchurian newspapers and magazines. The Japs had well trained units.

One Japanese pilot committed suicide. He flew down very low the whole length of the field. His rear gunner was obviously taking movies. Three or four hundred men were shooting at him and apparently hit the pilot or a vital part of the airplane. He made a quick turn and dove toward the power transformer station. He fell short and missed it by 100 feet. I think the pilot was wounded.

In combat, the Japanese pilot, in dive bombing, tried to get away always by making a sharp right turn. They all made right turns. They apparently tried to get you to turn with them so another Jap could fire across the circle and get you. They didn't attempt any suicide tactics such as ramming, etc. and they were obviously in a big hurry to get out of there when they saw that there were P-40s anywhere near.

The Japanese planes I saw were Navy dive bombers, Type 97, with retractable wheels. And then another type with non-retractable wheels—I am not sure about the model. I didn't see any two engine jobs at all, no bombers—and no pursuits.

The attack started approximately 8:00. I got into action at approximately 8:30. The attack ceased about 9:30 or quarter of ten. We were still flying around looking for more Japs. That was the last we saw.



For their actions during the Pearl Harbor attack, Lt. George Welch (left) and Lt. Ken Taylor (right) were awarded the Distinguished Service Cross at Wheeler Field on January 9, 1942.

About the training of the new pilots—we got pilots fresh from flying school. The Air Corps says that they are pursuit pilots and they send them to us. One bunch we got had one hour in a North American P-66. No acrobatics of any kind. At the present time we don't have enough airplanes with enough engine time left on them to give these boys sufficient experience. I was sent on a mission with another Lieutenant—we each took two new pilots to have a little simulated combat. Lieutenant Thacker had three P-39s—I had three P-40s. I dove on Lieutenant Thacker with my P-40s in a string. We had a general dogfight. One of these new pilots pulled up to try and get his sights on a P-40. He had so little experience with airplanes on usual positions that when the airplane stalled and dropped over he immediately bailed out. We have had several cases of pilots doing that at lower altitudes and not having time to bail out. Just spin in.

On the P-39, the gas tanks are self sealing and have compartments in them. These sections collapse. Your gas gauge may read 30 or 40 gallons, but actually you run dry. We noticed that trouble about a month ago. We had our airplanes then about four months. It was still occurring when I left the Hawaiian Islands. They hadn't found any way to correct it. The electrical system on the P-39 is very faulty. When the electrical is out, your prop feathers and drops to about 55 rpm. You can't keep it in the air unless you happen to catch it and turn it to manual. I think this is being corrected.

I have never seen the 37 mm on the P-39 fire correctly. I have seen them fired, but I have never seen them fire more than four rounds without jamming. Ordnance is working on that.

Approximately 75% of the 46th Squadron would rather have the P-39 than the P-40. I believe they like it because it's a newer airplane. I like the P-40 much better than the P-39 because of its higher rate of climb and because it is more maneuverable, more dependable, carries more gasoline and I am a little more familiar with it. However, if I were to run into large Japanese patrol bombers, I would prefer to have the P-39 because I would like to stay off at long range and shoot at them with the cannon before I closed in.

We didn't have enough ammunition to practice with. Each pilot was allowed 200 rounds a month for gunnery practice, which is worse than no practice at all. If we could have enough ammunition to run one mission a week, firing all six guns, and in the case of the P-39, the cannon, making ten passes at a target, ground or tow, preferably tow target. I think we would get sufficient practice. That would take about ten passes with six guns, firing in about five seconds each pass. You would get used to where the bullets were going and what it was going to feel like.

Editor's Note: We are indebted to Walter Beachell of Hockessin, Delaware, a financial analyst and amateur history sleuth, who discovered this document at the National Archives located at Maxwell Air Force Base, Alabama. In his research, he befriended Ed Horkey and George Welch's brother.

George went on to become an ace repeatedly during the War in the Pacific until he was incapacitated by contracting full-blown malaria. He joined NAA as an Engineering Test Pilot and broke the "Sound Barrier" in a dive in an XP-86 Sabre just weeks before Chuck Yeager accomplished the feat in the X-1. He repeated this act in the F-100 on its first test flight. Tragically, George died in a critical flight test in the structural demonstration of an F-100A.

Learning to Land the "Hun"

by Colonel Matthew B. Wallace, USAF (Ret.)

I graduated from Air Force pilot training in March 1957 with an F-100 assignment in my hand. That was about as good as life could get. First, I had to go to Williams AFB, AZ for 65 hours of F-86F gunnery school, then on to Nellis AFB, NV for F-100 transition training. My first permanent duty assignment was to George AFB, CA in September 1957. The base was reorganizing from a Day Fighter role to a Tactical Fighter role. We ended up with an F-100C wing and an F-100D wing. Each wing had four squadrons of 24 aircraft each. So there were eight squadrons of F-100s with nearly 200 aircraft and about 250 pilots. I never saw so many aircraft on one ramp before in my life! I was assigned to a squadron in the F-100D wing.

Two of the squadron commanders in the wing were Chuck Yeager and Robbie Risner. Robbie was a Korean War ace and became famous as a heroic prisoner of war in Vietnam. Both of them retired as Brigadier Generals. Two of my squadron buddies were Bob Dornan, who later became a long term Southern California congressman known as "B-1 Bob" for his support of the B-1 program and Joe Engle, who became an X-15 pilot and three-time Space Shuttle pilot. Joe retired as a Major General.

The pilots were a mix of "old guys" who had previous assignments in F-84 or F-86 units in Europe or Asia and "new guys" who were on their first assignment. There was also a smattering of Korean War vets, who were the squadron commanders and operations officers and a few WWII vets. All of the pilots were relatively new to the F-100 and few of them had much experience with inertial coupling or adverse yaw because this was the first airplane to so aptly demonstrate these characteristics.

One of the big challenges to the pilots was the traffic pattern. Some of the older pilots still liked to fly tight traffic patterns. This led to a number of landing incidents that got the attention of the Safety Office of the Tactical Air Command. I don't know the accident/incident rate, but I recall that we had more than a handful of damaging hard landings in less than a year. I don't call them accidents because no one was injured and I am not aware of the extent of damage to each aircraft. I do know that there was extensive damage to landing gears and tail skids caused by hard landings on the overrun or runway. The result was that Bob Hoover came to brief all pilots and fly some demonstration patterns and landings for us to observe.

The new procedure was to fly the normal overhead approach at 300 knots indicated airspeed (KIAS) and 1,500 feet above ground level (AGL). The overhead break at the approach end of the runway should be about 3-g instead of 4-g to give a slightly wider pattern. Lower the gear below 250 KIAS and bring the power up to 80-85% RPM. This would provide enough power to permit rapid throttle movement when more power was required without having to wait for the engine to spool up. You would then carry the downwind leg long enough to permit you to lower the flaps, add power to about 90% RPM and coordinate rudder in the direction of the turn. Then make about a 30° descending turn, maintain appropriate airspeed and rollout about one mile from touchdown at about 300 feet AGL.



U.S. Air Force photo

These new techniques resolved most of the landing problems, but not everyone flew perfect patterns all the time, and there were still a few hard landings that caused damage to the struts or tail skids.

Finally, an NAA Tech Rep gave us his evaluation. He informed us that during original flight test at Edwards AFB, the test pilots noticed the aircraft became unstable in transonic flight. The test pilots and flight engineers determined that there was too much horizontal stabilator authority in the transonic range, which resulted in oversensitive pitch control. This could be disastrous! The pitch control in all other phases of flight was fine so the fix was to install a stabilator travel limiter that would only permit the horizontal stabilator to travel at 12° per second.

The fix worked in all phases of flight except in low airspeed, high sink rate situations—as we were now just learning! In other words, if the pilot wanted to stop the rate of descent in the landing configuration, he could pull back the stick as hard and as fast as he wanted but the horizontal stabilator would only travel at 12° per second. That would be acceptable for a descent of 500 feet per minute at 200 feet AGL but if you were descending at 1,000 feet per minute at 200 feet AGL you did not have the pitch control authority to stop the rate of descent BEFORE the aircraft contacted the runway or overrun—HARD! That was why some of the aircraft were landing on the overrun before reaching the runway.

The solution was to fly a looser pattern: keep the engine RPM above 80% to provide instant additional power response and keep the vertical rate of descent below 500 feet per minute when over the overrun. The hard landing problem was resolved!

About the Author: Colonel Wallace received an AFROTC commission in 1955. Since his first operational assignment at George AFB, he has commanded two fighter squadrons and, stateside, served in Arizona, California, Florida and Nevada. Overseas, he served in Germany, Italy, Korea, Vietnam and Thailand. The Colonel is a Command Pilot with more than 5,900 flying hours and 335 combat missions in the F-100D and F-4E. His decorations include the Silver Star, Legion of Merit, Distinguished Flying Cross (one Oak Leaf Cluster), Air Medal (16 Oak Leaf Clusters), and the Vietnamese Gallantry Cross with Palm. Currently, Colonel Wallace resides in Las Vegas, Nevada with his charming wife Fran. We look forward to more of his experiences with the F-100D in future issues!

F-100 Fuel System Test From Hell

by Cleve Kimmel

When I first joined NAA in May 1956 and was awaiting my secret clearance to work on the X-15, I was assigned to assist George Patterson, a Senior Engineer of exceptional talent (plus a gracious aptitude for assisting a real neophyte—me) to complete a final test of the F-100 fuel system. Although, the F-100 had basically completed its production run, one SMALL item still remained to be verified. The fuel tank venting system had to be tested and fully approved to assure that it could accommodate a maximum descent! The vent line exit tip was located at the bottom of the fairing (an electrostatic discharge line was on top of the fairing).

Of course, I had never seen the F-100 aircraft—so I stole a look at one undergoing some modification on the factory floor. I was astonished as to its enormous size, and to the huge amount of wiring that was concealed behind the various access panels. It was then, I finally realized, that I was in the center of a truly great manufacturing giant—North American Aviation! George, my first boss, had been recently assigned to get the F-100 fuel venting system approved for this mission. At the time, this seemed very strange, since the aircraft was basically out of production! However, this one test remained or had been re-instated, and after apparently years of attempts had never been successfully demonstrated. To understand the requirement, remember that this was an all-weather supersonic fighter aircraft, and the mission flight envelope was classified, but had to be fully confirmed to accommodate any potential battle scenario in actual combat.

For those unfamiliar with a supersonic fighter aircraft fuel system and the technical concerns that existed in this new aircraft at that time, I'll try to explain:

The fuel tanks were constructed of thin aluminum shells, and had to be slightly positively pressurized at all times, and within very, very narrow pressurization limits. The fuel tanks were not pressurized from an external source, and the venting system, which exited at the rear of the aircraft, had to maintain a zero to a slightly positive pressure during all flight operations. George had calculated the performance and design requirements of the venting system tubing that allowed external air to enter the fuel tanks during descent, and exit during ascent without exceeding the system allowable structural pressures. As simple as this sounds, the rapid speed of the supersonic jet required a totally new approach; requiring knowledge of the fuel's light ends vaporization, dissolved gasses sudden expulsion and the like. Thus, the pressure had to be controlled within very tight and virtually impossible limits. Because this aircraft could accelerate and decelerate rapidly, compromises had to be made. To accomplish this feat, the Aerodynamics Group provided a pressure envelope that they thought exists at the rear of the F-100, without disturbance during various flight maneuvers. George, the fuel system group engineer assigned to the task of venting the fuel tanks, had to determine the effect that a tube (the fuel tank venting exit) had on the actual air flow available for use in maintaining the tanks pressure requirements. To adjust the amount of ambient air flowing into the tanks (ullage gasses) during descent—or the fuel vaporization and ullage gases during ascent, the exit tube that stuck out of the rear of aircraft would be cut at a very specific angle (scarfing) to conform to the needs of the aircraft. Compromises had to be made in the venting system to accommodate the rapid ascent and descent potential of the F-100, so in normal missions, more fuel might be lost due to vaporization as it climbed to altitude, than what could be better controlled with a slower ascending aircraft. However, high speed was the mission premise. This design was all accomplished years in advance of my arrival—so this is the story of the final tests after I arrived.



The fuel tank vent on an F-100C

An F-100 was fully instrumented as a test aircraft to record all pertinent data that would permit acceptance of the performance to verify the design analysis: altitude, speed, g-load, descent angle, rate of descent, tank pressure, fuel tank ullage volume and time. After each flight, reams of data were sent to George to examine and determine if the flight test was successful so that this "cloud" of uncertainty could be lifted. Please note, *"If the venting system was too small—the tanks could over-pressurize during ascent or under-pressurize (go negative) during descent. Either of these conditions could cause the tanks to rupture"*—and I guess you know what that meant! George gave me the opportunity to help reduce this huge pile of flight data onto 11"x17" graph paper sheets, so as to visually see if each test verified the calculations made for that flight. I suppose you can guess the results—these special tests were a complete failure, and George thought that enough was enough! Up to this time he had used several of the NAA flight test pilots for the test flights over-and-over with limited success, and decided to DRAG me along to confront them with the data. With shaking trepidation, I suspected that they were really getting really tired of these tests. The data he and I plotted and verified by the descent indicator and the time to descend confirmed that the mission wasn't accomplished and that George couldn't sign off on the testing. To understand the test—here it is—and, I personally wouldn't do it:

To stress the fuselage fuel tanks to their limit, load the F-100 with just enough fuel for the mission, takeoff and accelerate to maximum altitude (about 60,000 feet) with full afterburner, accelerate to maximum speed, roll over and descend at a 90-degree angle towards the earth maintaining max g-load, pull out about 10,000 feet and return to base.

This was a fighter aircraft, and it had to perform without having the fuel tanks crush because there wasn't sufficient pressure in them to maintain their structural stability, ingest atmospheric air at a positive pressure during the descent, or rupture during ascent and cause the aircraft to crumble and crash. I should also note that there was no indication that the pilot's seat ejection system would not operate in this environment, so I suspect that all considered the F-100 completely safe before the test!

George and I showed the pilots the instrumentation plots, noting that the pilots only achieved about 50-60 degrees during the descent, as I recall. George asked why? All stated that the angle of descent indicator in the aircraft was in error—and that they looked at the earth and knew they were going straight down based on years of flight experience. We argued for a while to no avail, then the only pilot who hadn't flown the mission, and who hadn't flown the F-100 for some time stepped forward and said: *"I'll fly the bird!"* (Wish I had written down his name!) After the test, George called him up and said, *"You didn't get 90 degrees."* But before the pilot could complain, George continued, *"YOU REACHED 89 DEGREES – THE TEST IS APPROVED!"*

So the question remains, *"Would any of you care to throttle the F-100 fighter straight down to earth at max g-force from about 60,000 feet to 10,000 feet to simulate an escape flight plan from an enemy plane—and then pull out, not knowing if the fuel tanks might collapse, and still expect to live?"* You have about 50 seconds to decide! This type of fuel system performance calculation was typical of what design engineers did for a living to assure that the pilot was safe, and the test pilots who placed their lives on the line in the belief that the engineers' design was correct. However, the F-100 was an exceptional first-of-a-kind fighter, and designers like George, and the test pilots who verified the machine were to be commended! We, of North American Aviation, knew that during normal flight operations, the vaporization of the fuel was more than desired, but the performance demanded a larger than normal venting system. In retrospect, I now wish I had an opportunity to experience that heart-pulsing feeling!

About the Author: After receiving his degree in Organic Chemistry from the University of Montana, Cleve enlisted in the Army and served for 3-1/2 years during the Korean War. Gifted with the ability to read and comprehend technical reports at 9,000 words per minute, he joined NAA in 1956 and was assigned to the Powerplant, Propulsion & Systems Group at LAD. He worked on various fuel and propulsion systems designs including the F-100, F-107, B-70, Navaho, Rocket Test Sled, Lunar Lander Simulator, Heavy Body Lift Bouyancy Transport, SST, and the X-15. He took an early retirement at 55 and currently resides with his charming wife, Adonna, in Billings, Montana.



USAF Photo

A flight of four F-100Cs. The F-100 was the first operational aircraft in United States Air Force inventory capable of exceeding the speed of sound in level flight.

Larry Korb Addresses Cadets at the U.S. Air Force Academy in April

Photos courtesy of Lt. Col. Angela Suplisson, USAF

As a result of the NAA award program implemented by the NAA Retirees Bulletin, our Larry Korb was invited jointly by the Astronautical and Aeronautical Engineering Departments at the U.S. Air Force Academy for a four-day visit on April 18-21, to give his speech *"Lessons Learned From the Manned Space Program"*. He gave his briefing to the first-class (seniors) cadets of both departments, repeated it to the third-class (sophomores) cadets. After a very informative discussion with faculty members on the engineering issues encountered in the Space Program, Larry was invited to an evening social hour with faculty members. On his final evening, he was asked to give a presentation titled *"Standing On the Shoulders of Giants"* to the Rocky Mountain and USAFA AIAA Chapters at the University of Colorado, Colorado Springs. Thank you Larry, you did us proud!



***Larry Korb briefing the first-class (seniors) cadets on* "Lessons Learned from the Manned Space Program"**



Department of Aeronautics Faculty Member Dr. Steve Brandt holds the torch as Larry demonstrates the imperviousness of Space Shuttle tiles to extreme heat with a participating cadet



Larry addressing the Rocky Mountain and U.S. Air Force Academy AIAA Chapters at the University of Colorado, Colorado Springs



A quiet moment in the Cadet Chapel during a tour of the Air Force Academy



Larry with his gracious hosts Capt. Donald Heaton (Astronautics) and Lt. Col. Angela Suplisson (Aeronautics)



A social hour with Academy Faculty Members at the Colorado Mountain Brewery included Lt. Col. Angie Suplisson, Capt. Donald Heaton, Col. Marty France (Astronautical Engineering Department Head), Dr. Ken Siegenthaler, Larry Korb, and Col. Neal Barlow (Aeronautical Engineering Department Head).

North American Aviation Outstanding Cadet Recognition Awards

Photos courtesy of Lt. Col. Angela Suplisson, USAF, Capt. Donald Heaton, USAF and Mark Winter

For a second year, the North American Aviation Outstanding Cadet Recognition Awards were presented to two United States Air Force Academy graduating cadets in the Aeronautical Department, one in the Astronautical Department and one in the U.S. Air Force Academy Preparatory School. These awards were sponsored and endowed by the North American Aviation Retirees Bulletin to be presented each year into perpetuity. In recognizing these outperforming and motivated individuals we wish to perpetuate the very best in the future with the name of North American Aviation, the company where creative minds in design, ingenuity in manufacturing and dedication in field service provided the very best in the defense of our country. We think it is only fitting that the name North American Aviation be associated with our young men and women who have volunteered to serve and defend our great Nation. God Bless them all!



John Sandford presents the NAA Award to Cadet First Class Jared D. Becker, the Outstanding Cadet in Aerodynamics, assisted by Dr. Russell Cummings, Aerodynamics Discipline Director.



John Sandford presents the NAA Award to Cadet First Class Joseph J. Boben for Excellence in Basic Research, assisted by Lt. Col.Chuck Wisniewski, Modeling and Simulation Discipline Director.



John Sandford presents the NAA Outstanding Achievement Award for Astronautics to Cadet First Class Dylan Asmar while being assisted by Colonel Martin France, Astronautics Department Head. Dylan is from Ridge Farm, Illinois.



The Outstanding Cadet Candidate at the U.S. Air Force Academy Preparatory School was Calvin P. Llarena receiving the NAA Recognition Award from LTC John Swanson, U.S. Army Reserve. Calvin is from Daly City, California. A good friend of the NAA Retirees Bulletin, John was pleased to again represent NAA at this proud function.



Photo courtesy of Lt. Col. Angela Suplisson, USAF

Receiving a warm welcome from the faculty upon his arrival, John Sandford is greeted by Col. Neal Barlow, Head of the Department of Aeronautics; Lt. Col. Angela Suplisson, Deputy Head of the Department of Aeronautics; and Capt. Donald Heaton, Instructor, Department of Astronautics.

Saturday, 28 May 2011

Ed,

The two days spent this week at the Air Force Academy North American Aviation awards ceremonies were rewarding and uplifting. I was particularly impressed with the young men and women recognized for their exemplary academic performance in aero and astronautic subjects. The USAF's future will be safe in their hands. What's more, they are great role models for their peers and their generation. The NAA recognition awards and plaques were much appreciated by the recipients, the Academy and the Aero and Astro Departments.

Before the ceremonies, I received a 'VIP' tour of the facilities and labs. Lt. Col. Suplisson, also arranged a small informal dinner with Col. Neal Barlow, Professor and Head of the Department of Aeronautics, and several of his key staff and wives. All were quite familiar with NAA, its history and wide range of products.

It was an honor to represent NAA and our retirees.

— John S

New Silver Eagles

RICHARD K. ALLEN
F. B. IVAN
TOM H. CHAISSON
DALE A. COMER
MERLE W. EIDE
BARRY S. GARMENT
JAMES W. HAFFNER
SANDRA S. HARVEY
PAUL N. HIRSH
DAVID T. KIRBY
MORRIS S. LOYD
WALLACE J. (WALLY) LUTHER
FLOYD MOHR
DONALD P. MURPHY
PETER A. PRICE
PATRICIA A. (PATTY) SWANSON

Lost Sheep

W. LEE WILTSE (FOUND)
VICTOR Q. HOFFMAN
THOMAS W. MILLER
MARION M. TOWNSEND

Silent Majority (Date of Death)

NORA BANNARD (06/27/2010)
AL W. BLACKBURN (03/21/2011)
BARNUM L. "BARNEY" BITTING (03/19/2011)
ERWIN "EDDIE" DAHL (03/11/2011)
TOM T. GONDO (01/07/2011)
BASTIAN "BUZ" HELLO (02/12/2011)
CHARLES F. JOYNER (03/25/2011)
MORRIS S. "MORRIE" LOYD (04/30/2011)
GEORGE E. RAMBERG (03/23/2011)
ARCHILL L. "ROY" ROY (03/17/2011)

Congratulations and Best Wishes to

David and Eileen Herold of San Marcos, California celebrating their 64th Wedding Anniversary

Obie and Gladys Telford of Hemet, California celebrating their 60th Wedding Anniversary

Stanley and Edda White of San Clemente, California celebrating their 55th Wedding Anniversary

Bill and Jackie Clelland of Lake Elsinore, California celebrating their 50th Wedding Anniversary

Clint and Beverlie Wood of Sun City, Californioa celebrating their 50th Wedding Anniversary

Harry Moshenrose of Southgate, California upon receiving a Commendation from Pope Benedict XVI for his 27 Years of Service at St. Raymond Church in Downey, California

Endeavour *Completes Her Final Mission*



Space Shuttle *Endeavour* landed safely at NASA's Kennedy Space Center on Mission STS-134 in the early morning hours of June 1, 2011.

The crew members for STS-134 were Commander Mark Kelly, Pilot Gregory H. Johnson and Mission Specialists Michael Fincke, Greg Chamitoff, Andrew Feustel and European Space Agency astronaut Roberto Vittori.

During the 16-day mission, *Endeavour* and its crew delivered the Alpha Magnetic Spectrometer to the International Space Station.

STS-134 was the 25th and final flight for *Endeavour*, which spent 299 days in space, orbited Earth 4,671 times and traveled 122,883,151 miles.

Endeavour will be displayed permanently at the California Science Center in Los Angeles.

Space Shuttle *Atlantis* will conduct the final mission of the Space Shuttle Program on Mission STS-135.

The 49th Annual Bald Eagles Reunion

Photos by Lee French



Ed "Moke" Mokeslaveskas



Earl Theaker



Featured Speaker
Ralph Wetterhahn



Ed Rusinek presents a gift of appreciation to Larry Korb and John Sandford



Ed Mokslaveskas thanks Ralph Wetterhahn for his riveting presentation with a scale model fighter



Ed Kaston, NAA Tech Rep



Cathy and David Baker



Carol Wetterhahn at
Ralph Wetterhahn's book signing



Frank Beckman, Stan Guzy, and John Casey, Jr.



Dale Myers and Pete Magoski



Lou Tiberio and Sonnie Robertson



Mary Romanoff and Janet Bisby



Stefani Operacz and Ed Rusinek



Dana Muelot, Cindy Macha, and Earl Theaker



Jean Pinataro, Frank Doucette, and Anne Williamson



Dave Marshall and Cathy Rodriguez



Joe Onesty and Jo Ann Kock



Rachel Gomes and Les Lackman



Hank Francovig, Mike Luciano, and Ace Evans



Ivy and Charlie Chin

Contrails From The Past

by Ed Rusinek

Dear Mr. Rusinek,

It was a real pleasure to get the Spring Issue of the Retirees Bulletin which had the Salute to the NAA Retirees Bulletin Silver Eagles. I scrolled down the list and there was my mother, Joy Lindley. She loved getting the Bulletin and looking for familiar names from the time when my father, Cooper F. Lindley, worked at NAA (from 1943 to 1972).

Mom passed away in September 2010, which means you should probably cancel her "lifetime" subscription. I will personally miss getting the Bulletin since I also worked at NAA at Downey as a teenaged vacation fill-in in the Summer of 1961 on the Apollo project. I often recognize names from my parents and my past.

Thanks for all your good work – it's a lovely read.

—Claudia Tropila, Fountain Valley, CA

Ed's Ans.: Thank you for your charming letter. We printed the Salute because we thought our readers would enjoy reminiscing about the names as they went down the list. My daughter, Anita, was also a teenager temporary hire in Downey for two summers. She still utilizes the terminology, business practices and ethics she learned with Gunther Schurr.

Dear Ed,

Just finished Roger Wood's interesting article on the RA-5C Vigilante. I was a Special Weapons Officer aboard the *USS Saratoga* (CVA-60) in the early sixties, during which RVAH-9 was flying the bird. This was only a few years after the "Revolt of the Admirals" ended with the USAF being awarded the strategic defense mission, and the attack version of the A-5 being retired in favor of the advanced reconnaissance version. Few people knew, however, that the RA-5C retained nuclear delivery capacity, and for some years the Navy quietly retained this attack capability. After all, the reconnaissance Vigilante still had its linear bomb bay and jettisonable fuel cells. It was not difficult to replace the aft cell with a nuclear store, although the loading operation itself was ticklish and never any fun in a seaway or in the rain. Still, it could be done and our redshirt teams accomplished the feat many times.

Thank you for a great issue. It was one of your best.

—Ray Puffer, Victorville, CA

Ed's Ans.: Thank you Dr. Ray. As a Historian at Edwards AFB for eight of our ten years, you have always stood with us with articles, photos and good common sense. We shall always be grateful for your kindness, patience and graciousness.

Dear Ed,

We really enjoy the bulletin. My wife, Joyce, and I have a lot of family history at NAA. My father, Clifford Lawrence, started in 1936 and retired in 1972, and is doing well at 93 in Yucaipa, CA. Joyce's father, John Fleetwood, was Director of Apollo Manufacturing and passed away in 2002. Joyce and I both worked in Downey. We sold our home in Downey in 2000 and retired to SW Colorado.

Even though I am a Silver Eagle, I am enclosing a donation.

—Roger Lawrence, Dolores, CO

Ed's Ans: In 1955, lured by promotion to a Specialist grey badge, I went out to the shop as a Material Review Engineer on the Navaho. John Fleetwood was in charge of Manufacturing. Although short in stature, he made the tallest in Inspection tremble whenever he approached. Always conscious of the Navaho production schedule, he would have me stand by while his workers completed my repair disposition to my satisfaction and have me sign off on the workmanship the moment it was done. Thank you for the generous donation.

Dear Ed,

Having celebrated my 95th birthday in January and having been retired for 35 years, I thought it was time to communicate before all my peers disappeared. Although most of my career was in the Advanced Design group, I spent some years at Space Division and a stint in Ocean Systems. Probably, the most fun was preparing the proposal for the F-108, Mach 3 interceptor weapon system. Thank you for keeping the memory alive of the greatest design and manufacturing team in the industry—ever.

—Charlie White, Spring Valley, CA

Ed's Ans.: Always great to hear from you, Charlie! Stay young!

Dear Ed,

I read with interest about the use of René 41 alloy on the X-15 program. I was a turret lathe operator in Dept. 1. The first job with that material was assigned to me. I spent an entire shift trying to find some tool that would not burn up when it came in contact with that material! Sadly, at the end of my shift, with my workbench covered with burnt tools, I gave up and left it for the next shift to try their luck!

—John Flynn, Hobe Sound, FL

Ed's Ans.: John, you were one of the many that made NAA great! The answers did not come easily but the intuitiveness, ingenuity and persistence resulted in the greatest achievements the world had ever seen! God Bless!

How far you go in life depends on your being tender with the young, compassionate with the aged, sympathetic with the striving and tolerant of the weak and the strong. Because someday in life you will have been all of these.

— George Washington Carver

The Silent Majority

by Stan Guzy



HELLO, BASTIAN "BUZ", 87 – Buz Hello passed away on February 12, 2011 in Potomac, MD. He began his aerospace career with the Martin Company where he held key positions in several aircraft and manned space programs. After the Apollo 1 fire, he joined the Rockwell Space Division as the Division vice president and general manager of Launch Operations at KSC. With the Space Shuttle program, Buz served as the division vice president and program manager of Space Division in Downey, CA. Subsequently, he moved to LAD where he became president of North American Aircraft Operations in charge of the production effort on the B-1B. In 1997, he was made president of the Aircraft Group which included NAAO, Tulsa Division, Sabreliner Division, and the General Aviation Division. He received two NASA awards and was elected a Fellow of the American Institute of Aeronautics and Astronautics. He is survived by his wife Carolyn. He will always be remembered for his indefatigable efforts to win the Space Shuttle contract and to recover the B-1 program with the B-1B. Bravo!

BLACKBURN, AL W., 87 – passed away in McLean, VA on March 21, 2011. Upon graduation from the U.S. Naval Academy in 1944, Al entered the Marine Corps and saw infantry duty on Okinawa and North China. He applied for flight training and obtained his wings in 1947. He flew carrier-based F4U Corsairs. Joining the Reserves and enrolling in graduate school at MIT, he received an M.A. degree in Aeronautical Engineering. Recalled to active duty, Al was assigned to the Patuxent River Naval Air Test Center where he flew tests for the Armament Test Division. Released from active service, he joined NAA as an engineering test pilot and is probably best remembered for his successful F-100 Zero Launch tests. Al retired in 1958 from NAA with 6 years of service. He later joined the Pentagon and also became a Fellow and President of the Society of Experimental Test Pilots. He is survived by his loving wife of 54 years, Donna.

LACHAPPELLE, THEODORE J., 90 – of Orange, CA, passed away on February 3, 2011 from complications following a stroke that he suffered in 2004. He had joined the Autonetics Research, Engineering and Reliability Division in 1963 and retired in 1988, having served for 25 years as a brilliant scientist. Ted was a research chemist, working with Glenn Seaborg on the Manhattan Project during WWII and was cited as the first person to identify the man-made transuranic element, Neptunium. While on the project, he met and married fellow research chemist, Mary Ellen, with Seaborg serving as best man. Ted was a charter member of the Autonetics Branch of the Scientific Research Society of America (RESA). He is survived by Mary Ellen, his loving wife of 65 years.

ANDERSON, JOHN H., JR., 85 – passed away at his home in Long Beach, CA on January 17, 2011. When John retired from LAD in 1990 as a warehouse supervisor, he had served 43 years. He is survived by his loving wife of 60 years, Aileen.

ANDERSON, VILLARD E. "ANDY", 89 – of Rancho Palos Verdes, CA died on June 10, 2010 after suffering Parkinson's disease. Andy served with the 15th Air Force in Italy, flying 30 missions. Graduating from the Northrop Institute, he joined NAA as a design engineer on the F-86, F-100, B-70 and the B-1. He retired in 1979 as manager of the B-1 Nacelle Group. He is survived by his loving wife of 66 years, Doris.

BANNARD, NORA – the Bulletin has been notified that Nora passed away in Toney, AL on June 27, 2010. Nora and her late husband both served at LAD and Palmdale. She retired in 1978 with 18 years of service.

BARRY, JOHN R., 85 – a resident of Hawthorne, CA, passed away on March 27, 2011 in Torrance, CA. John had served in WWII and was a graduate of the University of Massachusetts. He worked on many programs as an engineer at NAA/RI and took a well-earned retirement in 1989 after 26 years of productive service. John is survived by his wife, Charlotte.

BEESON, MARVIN – passed away on April 10, 2011 in Southern California with his family at his bedside. Marv had been a long time employee in the engineering department at Autonetics, retiring in the early 1990s. He is survived by his devoted wife of 57 years, Ann.

BENNETT, EDWARD L. – renewal reminder card returned stamped "Deceased – February 9, 2011". From El Segundo, CA, Ed retired from LAD in 1978 with 40 years of service.

BITTING, BARNUM L. "BARNEY", 79 – passed away in Placentia, CA on March 19, 2011. After serving in the Navy during the Korean War where he learned his plumbing and pipefitting skills, he joined Autonetics and is best remembered for his quick response to plumbing emergencies in his service cart. Barney retired in 1999 with 47 years of service. He is survived by his loving wife of 26 years, Ruth.

BLISS, RUTH F., 93 – passed away on April 28, 2011 at Loma Linda Hospital in Loma Linda, CA of heart failure. Ruth was an artist and served in the LAD art department for 30 years when she retired. She received many awards as an artist.

BRATFISCH, WARREN A. "PAT" – of Mesa, AZ, subscription card returned indicating Warren died on

October 12, 2010. He joined LAD and retired from Space Division in 1978 with 35 years of service.

CLOTWORTHY, LEONEL H., 89 – of Redondo Beach, CA passed away on February 16, 2011 following heart surgery. Leonel earned his B.S. degree from the Northrop Institute of Technology. He served in the U.S. Navy aboard the *USS Indianapolis*, *USS New Jersey*, and the *USS New Mexico* before he joined LAD as a structural design engineer. He retired in 1979 with 31 years of service. Named volunteer of the year by his church, he was recognized for his weekly pickup of baked goods from local markets for delivery to the Salvation Army His House Family Services. He was a delight to be with.

COLLINS, EDWARD A., 91 – of Palos Verdes Estates, CA passed away on March 2, 2011. Ed started at NAA on the flight line and advanced to Field Service. He left to serve with Marine Air Group MAG-62 in the Pacific, working on B-25s. Returning to NAA, he advanced to Senior Field Rep at LAD, Autonetics and Space Division. He retired in 1978 with 39 years of service. He is survived by his loving wife of 57 years, Lori.

COX, JOHN W., JR., 91 – was called to his Creator on March 3, 2011 after a short illness. He was a local aviator and author, a member of the NAA/RI Flying Club at Fullerton Airport, a combat veteran of WWII and a retired NAA/RI engineer. He was very proud of the self-published story of his WWII experiences as the commander of a B-29 in the Pacific. John's wife, Dixie, passed away in 2007.

DAHL, ERWIN "EDDIE", 90 – of Downey, CA, succumbed on March 11, 2011. During WWII, Ed served with the 3rd Emergency Rescue Squadron. He joined NAA in 1946 and served on several major programs including the Space Shuttle simulator and the B-1 simulator. He retired from LAD as a project engineer in 1986 with 39 years of service. He is survived by his loving wife of 62 years, Catherine.

GONDO, TOM T., 73 – passed away in Anaheim, CA on January 7, 2011. After graduating from Cal Poly San Luis Obispo in 1960, Tom came to Autonetics where he served as a systems engineer on various programs. He specialized in preparing software, specifications and in supporting qualification testing. He attended UCLA and earned an M.S. degree. Tom retired in 1998 with 38 years of service.

JOYNER, CHARLES F., 89 – passed away in Granbury, TX on March 25, 2011. Charles began with NAA in Contracts and Pricing at several sites. He retired from Space Division Seal Beach with 30 years of service. He is survived by his loving wife of 65 years, Mary.

LIECHTY, HOWARD B., LT. COL., USAF RET., 90 – of Mount Angel, OR died on May 29, 2010. After long service with the Air Force, Howard came to LAD and served in Marketing for over 33 years before retiring in 1983. He is survived by his caring wife of 31 years, Donna.

LOYD, MORRIS S. "MORRIE", 94 – passed away in Caldwell, ID on April 30, 2011. Arriving in California in 1936 at 19, Morrie went to work at LAD on the P-51 production line as a sheet metal "expert". Although short on formal education, he developed three patents, served in engineering, the experimental lab and advanced to production management before retiring in 1976 with 40 years of service and became an engineering consultant. Morrie's heart was broken when his beloved wife of 68 years passed away last year.

MALINOSKY, ANTHONY F. "TONY", 101 – died in Oxnard, CA on February 8, 2011. He was a third baseman and shortstop in Major League Baseball, playing 35 games for the Brooklyn Dodgers in the 1937 season. During WWII, he saw combat in the Battle of the Bulge. After the war, he joined NAA and became a supervisor in the plastics and bending department at the NAA Torrance plant.

MARZULLO, RALPH A., 95 – died in Torrance, CA on February 13, 2011. Ralph began his career in the 1930s, working on the DC-2 at Douglas. During WWII, he came to NAA to work on the P-51 Mustang. He also served on the Apollo and Space Shuttle programs. Ralph was very active in the Torrance YMCA until he was well into his 90s. He was preceded in death by his loving wife of 59 years, Calista.

MASTRACCI, DAVID S., 78 – passed away in Columbus, OH on May 11, 2011. A graphic artist and illustrator, David retired from the Columbus Division Graphic Arts Department in 1989 with 30 years of service. He is survived by his loving wife of 51 years, Lenore.

McDONALD, FLORENCE, 97 – passed away in her sleep at her home in Gardena, CA on April 12, 2011. Flo served in the Accounting Department at LAD from 1953 until 1970. She was a hard worker with a pleasant disposition.

MERCADANTE, DOMINIC S., 86 – passed away April 14, 2011 in Fullerton, CA. He joined the Army in 1943, served with the 36th Infantry Division as a field artilleryman, and was taken POW in Germany. After the war, he married Catherine Reid, moved to California and became an aerospace engineer at NAA. He was part of many historic projects and helped build the Saturn V rocket.

MORTON, ALAN, 85 – died on April 1, 2011 in Fullerton, CA. Born in Wilmington, Delaware, he spent much of his youth in Scotland with his Aunt Margaret. He served in WWII as a turret gunner in a B-17 flying missions over Germany. After attending Ohio State University, he joined NAA as an illustrator and technical writer for astronaut training on the Apollo Program. After the Apollo 1 fire, Al left aerospace and became a successful real estate broker in Fullerton, CA. He prompted the Fullerton City Council to name three parks after the three Apollo astronauts killed in the disaster. Alan is survived by his ex-wife, Barbara Scown.

RAMBERG, GEORGE E., 77 – passed away in Shingle Spring, CA on March 23, 2011. George was a computer analyst at NAA and retired from the Semiconductors Product Division in 1994 with 44 years of service. He is survived by his loving wife of 23 years, Osa.

RAY, JAMES M., 78 – passed away in Banning, CA on March 18, 2011. A Navy veteran of the Korean War, Jim served in Autonetics, Seal Beach and LAD. He was president of the National Management Association during his 29 years of service when he retired from the Corporate Office in 1988.

RADZINS, EGONS J., 75 – died on December 31, 2010 as a result of Parkinson's disease. Born in Cesis, Latvia during WWII, Egons grew up in refugee camps in Germany. In spite of this hardship, he graduated from the University of Michigan with a B.S. Aeronautic Engineering degree. Joining NAA, he served on Minuteman, Saturn, Apollo, Skylab, and Shuttle programs. His wife Carole preceded him in death.

REDER, JOSEPH, 87 – succumbed to cancer on January 23, 2011. Joe served at the Space Division for 17 years on the Apollo and Space Shuttle Programs. In 1977, he transferred to the Hanford Operation in Richland, WA as one of the engineering managers. When the NAA/RI contract expired, Joe assumed a similar position with Westinghouse on the new contract. He took final retirement from Westinghouse with 35 years of dedicated service to NAA/RI.

ROY, ARCHIL L. "ROY", 75 – died in Oriental, NC on March 17, 2011 while working on his boat. After serving in the USAF and obtaining his B.S.E.E. from the University of Rhode Island, Arch joined NAA at Space Division in 1961. Subsequently, he transferred to Autonetics where he was primarily dedicated to the Minuteman program. After 31 years of service, he and his wife cruised Central and South American waters on their sloop *"Yankee Rogue"*. They eventually settled in the small sailing village of Oriental, NC, where they founded and continued to support the nonprofit Shoebox Project to assist women, children and veterans. Arch is survived by his loving wife of 45 years, Tye.

SCHLEICH, WILLIAM T. "BILL", 83 – of Fullerton, CA passed away on May 6, 2011 from complications associated with Parkinson's disease. Bill joined Space Division after graduating from Georgia Tech, specializing in guidance and control. His assignments included the Saturn and Shuttle programs. He retired in 1990 as manager of flight control systems with 38 years of service. Bill is survived by his loving wife of 56 years, Jackie. He will always be remembered as a quiet man with a quick smile.

SCHNAUFER, DON – of Dallas, TX passed away on February 2, 2011. No further information was provided. Don was in Program Management in Space Division. After the Apollo 1 fire, he was a very effective leader in the preparation of Apollo 7. Don retired in 1981 with 20 years of service.

SULLINGER, LELA, 81 – of Riverside, CA passed away on January 5, 2011. She served in computer programming on the B-1 and retired from LAD in 1985. She belonged to the NAA Camping Club, was a good friend and will be sadly missed.

SWAN, THELMA V. J., 98 – Thelma lost her struggle with pneumonia on February 17, 2011. Today she rests in eternal life with her beloved husband, Allen. After struggling through the Depression and when WWII began, Thelma took a job with the Army Air Forces. When the war ended Thelma continued to work as an executive secretary to the Vice President of aerospace giant NAA/RI. Her husband suffered a massive heart attack in 1971 and soon after Thelma retired from NAA/RI, she began a new career in the travel business.

SWANSON, PHILLIP F., 83 – died on March 17, 2011 at his home in Huntington Beach, CA of complications resulting from prostatic cancer. Phil retired from NAA/RI Space Division in 1986 after 31 years of dedicated and productive service in the engineering disciplines. He is survived by his faithful and loving wife of 53 years, Dorothy. A true and loyal friend will be missed.

ZASTROW, FRANCES, 85 – a resident of Anaheim, CA passed away peacefully on January 22, 2011. After marrying Gary Astros they moved to California where she began a 25-year career with NAA/RI Marine Systems Division Software Engineering Department. They had been married 55 years when Gary preceded her in death in 2001.

A LOST SHEEP ACCOUNTED FOR

We were saddened to learn from Joe Onesty and Chuck Lowry that Philip D. Wilts, a Lost Sheep Silver Eagle, died on July 11, 2005. Phil retired from Space Division in 1985 with 26 years of service. We salute his memory.

PAX DOMINI SIT SEMPER VOBISCUM

NORTH AMERICAN AVIATION
RETIREES BULLETIN
P.O. Box 3797
Seal Beach, CA 90740

North American Aviation Retirees Bulletin
"Where The Best Never Rest"

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During his four-day visit in April to the U.S. Air Force Academy, our Larry Korb was invited to an informal combined meeting with the faculty members of the Astronautical and Aeronautical Engineering Departments. Among those present were Maj. Art Cartwright, Maj. Tara Webster, Capt. Uriah Tobey, Maj. Neil Thomas, Col. Marty France, Dr. Ken Siegenthaler, Mr. Larry Korb, Mr. Steve Weiss, Lt. Col. Angela Suplisson, Col. Neal Barlow, Lt. Col. Scotty Nowlin, Dr. Tom McLaughlin, and Maj. Nidal Jodeh.

NORTH AMERICAN AVIATION
Retirees Bulletin

"Where The Best Never Rest"

Fall 2011

Inside:

NAA AT CAPE CANAVERAL AND KSC–PART V by Bill Edson

APOLLO SNAPSHOTS by Dave Levine

THE NORTH AMERICAN AVIATION MX-770 PROJECT by Dave Stern



After securing the crew of Mission STS-135 on Launch Complex 39A, the Closeout Crew performed a final tribute to the Space Shuttle Program's 30 years of space flight on July 8, 2011 at the Kennedy Space Center.

NORTH AMERICAN AVIATION
Retirees Bulletin

North American Aviation Retirees Bulletin, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAA Retirees Bulletin can be contacted at The Boeing Company, Seal Beach facility by phone at (562) 797-3836. Send mail to:

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Seal Beach, CA 90740

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Retirees Bulletin
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Dear NAA Retirees Bulletin Subscriber

This has been a happy time and a hard time for your staff on the North American Aviation Retirees Bulletin. Your response to our affiliation with the U.S. Air Force Academy has been overwhelmingly positive. We have received praise and several splendid donations! However, our joy has been tempered by the abrupt end to the Space Shuttle Program with the landing of STS-135. Thousands of our friends got their pink slips the day after *Atlantis'* wheels came to a stop at KSC. To close out the program with three vehicles still intact and ready to go is very shortsighted and thoughtless. To pay Russia $60,000,000.00 to take one of our astronauts on board the Soyuz to the Space Station is absurd! What will President Obama do if and when there is trouble aboard the Station and it will have to be evacuated? Who will select who is to be rescued and who must remain?

We are pleased to have Bill Edson return with Part V of his report on the North American Aviation presence at the Kennedy Space Center. Here, he takes us through the phase of investigation and testing after the Apollo 1 fire and all the unmanned Apollo test flights in preparation for the first manned flight, Apollo 7. Although Bill has accumulated a tremendous amount of data from his days at the Cape, he is still very capable of relying on his memory for many of the historic events that occurred there during those fantastic days, fifty years ago!

When you consider that North American Aviation came into being in the early 1930s and became the leading aircraft manufacturer in the early 1940s and the leading aerospace company in the 1950s, it is almost beyond comprehension that it no longer exists! Leadership! Leadership is everything and Dutch Kindelberger was that leader! After he died, it was only a matter of time and we were led by a bunch of lukewarm noodles! Anyway, our history sleuth, Dave Stern, is back from his search of dusty national archives with his latest find-the MX-770 program. This was the crucial contract that transferred North American Aviation from an airplane builder to an aerospace conglomerate that included the Los Angeles, Columbus, Space, Autonetics, Rocketdyne and Atomic Energy Divisions. The designs appear almost archaic and childish; but remember, this was still the age of slide rules, T-squares and vacuum tubes. In that context, these concepts were a giant leap forward!

We asked our friend from the early days at Downey, Dave Levine, to provide us with an article. He didn't write an article, yet! But, he did provide a few vignettes that we called Apollo Snapshots. We thank him and hope he will return with more of them.

Before we close – one last favor! Try to stay as healthy as you can! Stay away from "junk" food! If you are overweight or diabetic, lose some pounds! If you still smoke, cut it out! If you booze, limit it to a small glass of red wine with dinner! Stay away from those white wines—that stuff will kill you! At our age, a visit to a church or temple to chat with God can't hurt. Lastly, keep walking—make it hard for the Devil to find you! One place we don't want to find you is in the Silent Majority. Incidentally, we have more Nonsubscribers listed in the Silent Majority than Subscribers. So, renew your subscription for 2012 and improve your chances of staying alive next year! God Bless!

NAA At Cape Canaveral And KSC – Part V

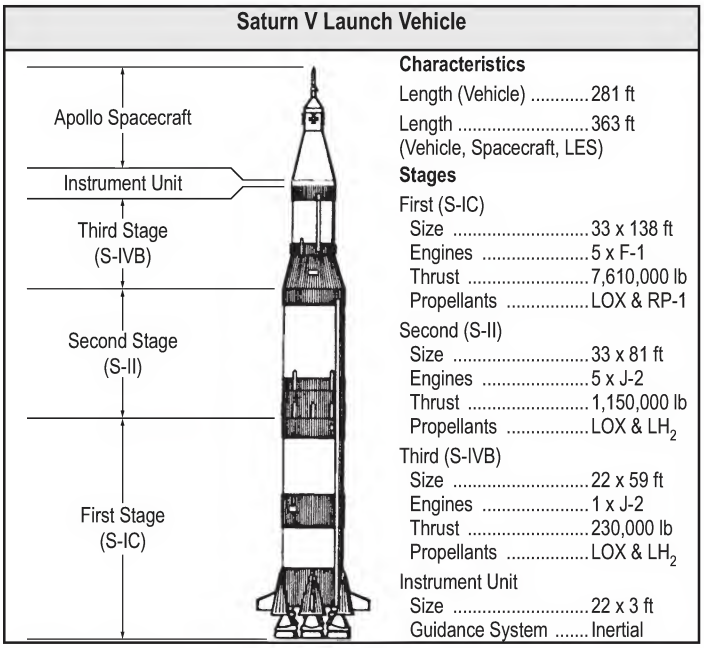
by Bill Edson

Introduction

Significant highlights of the Apollo, Apollo Applications (AAP) and Space Shuttle Programs at Kennedy Space Center (KSC), from an engineering and ground operations perspective, will be discussed in my final articles. Many of these highlights that created history also caused life to be fun and exciting yet frantic for us at KSC. They will focus on activities that affected our work environment and our lives from the time of the Apollo spacecraft "disaster" in January 1967 through termination of our Space Shuttle launch processing contract in 1984. I will identify a few of the more significant goals and objectives of the space program and programmatic decisions made, that on the surface may not have appeared to be of great importance, yet were key to our overall success. This will include a few of the challenges we faced and accepted, and will focus on the continued progress the team made as we processed and launched flight hardware. A few memories, some of which are pleasant and some sad reminders of the "good old days" with which many of us are familiar will be included. My story wouldn't be complete if I didn't recognize several of those individuals who in my estimation were most instrumental in our progress and success at KSC regardless of affiliation.

Spacecraft Flight Test Planning 1967 – The initial Block I Apollo Command/Service Modules (CSMs) and Lunar Module Test Articles (LTAs) were flight tested on the smaller Saturn IB launch vehicles. The spacecraft flight test program depended on the use of a Saturn V for missions that dictated larger payloads. It was designed to utilize two distinctly different configurations of flight hardware within overlapping flight test phases. CSM Block I hardware was designed to be utilized on sub-orbital and on unmanned earth orbital phase tests and for one single manned earth orbital flight (AS-204). The more advanced CSM Block II hardware was designed to support manned earth orbital and lunar phase missions and to accommodate rendezvous and docking with the Lunar Module (LM). The flight operational capabilities of the spacecraft and launch vehicle systems and subsystems were intended to be used extensively in support of the development and qualification not only of the flight hardware but also of launch, mission support and recovery team personnel.

Apollo S-II Technical/Management Concerns 1965-67 – Throughout 1965 and 1966, relations between NAA and NASA management became strained due to CSM and S-II delivery delays, quality workmanship issues and cost overruns. In the summer of 1966, S-II stage delivery problems were a major concern for the lunar program. While the first stage (S-IC) and third stage (S-IVB) had only a few outstanding problems to resolve, the S-II stage had numerous design and manufacturing technological challenges. It was the largest rocket stage ever built that utilized liquid oxygen and liquid hydrogen propellants. It was also the most difficult of the Saturn V stages to design and to manufacture. In the previous year, two S-II structural/dynamics- and test-dedicated stages had been accidentally destroyed during the conduct of test programs. S-II-S/D was destroyed during a hydrostatic load test of the propellant tanks at Seal Beach in late



September 1965, and S-II-T was destroyed at the Mississippi Test Facility (MTF) in late May 1966 by an accidental tank overpressurization. Early in 1967, continuing problems with the LH_2 tank structure (hairline cracks), common bulkhead design, precision welding and tank protective insulation design and manufacturing processes still had to be resolved.

Apollo-Saturn 501 (AS-501) Flight Hardware Processing

Late in the third quarter of 1966, each element of Apollo-Saturn 501 (AS-501) hardware was delivered to the Vertical Assembly Building (VAB) for stacking with the exception of CSM-017 and S-II-1. The CSM hardware was not expected at KSC until late December 1966 and the S-II-1 stage delivery to KSC from MTF had recently slipped 6 months from July 1966 until January 1967. Early in the fourth quarter, the NAA Spacecraft Lunar Module Adapter (SLA) and the Grumman LTA-10R were delivered to the Manned Spacecraft Operations Building (MSOB) for hardware processing and mate. As a consequence of the late deliveries, stacking of the AS-501 vehicle proceeded as planned utilizing the S-II "spacer" and the CSM Facility Verification Vehicle (FVV) hardware previously used on the AS-500F FVV earlier in the year. Upon completion of the stacking operation, the launch vehicle moved ahead with the planned stage test activities. On the Apollo program, Saturn V launch vehicle integrated and stage test operations were monitored and controlled from one of four firing rooms located in the Launch Control Center (LCC) in the VAB, not from a remote blockhouse as on the Saturn IB. Spacecraft and ground system test operations were monitored and controlled from one of two Control Rooms located in the MSOB. RCA-110 computers were the backbone of the launch vehicle checkout system, while the GE Acceptance Checkout Equipment (ACE) provided the CSM and LM checkout capability. NASA provided a test supervisory control and monitor function over CSM and LM ACE control room test operations in the MSOB and over each

launch vehicle stage test operation in the LCC. The NASA Test Director in the LCC was responsible to monitor and control overall Saturn V test operations. Upon arrival of the AS-501 CM, SM, and Launch Escape System (LES) shortly before Christmas 1966, the flight hardware elements of the Apollo 4 spacecraft joined the LTA-10R and SLA in the MSOB and initiated processing through the facility. Upon completion of the CSM-017/SLA mating operation, the spacecraft was moved to the VAB where it was structurally mated to the AS-501 stack replacing the CSM-FVV. Shortly afterwards ground system hookup and test and checkout operations were initiated. For the next few weeks CSM-017 participated in the spacecraft electrical mate and launch vehicle integrated test in the VAB. Late in January, the S-II-1 stage arrived from the MTF and inspection and checkout operations began in the VAB low bay. On January 27, 1967 while the AS-501 team was involved with CSM-017 spacecraft test operations in the VAB high bay, the AS-204 team was conducting a "plugs out" test on Launch Complex 34 (LC-34). The unexpected happened when fire was observed internal to the CSM-012 spacecraft on LC-34 and we had an explosion. The incident cost the lives of three astronauts and set the Apollo program back on its heels. After the incident at LC-34, the focus of the Apollo program reverted to the damaged spacecraft, what happened and why? In early February while a review of the potential cause of the CSM-012 fire was in progress, an investigative team requested that CSM-017 be removed from the AS-501 VAB stack for a detailed review, inspection and analysis of its condition. They felt it imperative that an evaluation of wire bundles and the plumbing systems of a Block I spacecraft similar to the AS-204 CSM spacecraft be accomplished. CSM-017 was removed from the stack and at the same time the S-II-1 stage that had arrived from MTF and was being processed in the VAB was installed, replacing the "spacer". When the stack was reassembled this time, it was done without a payload. During subsequent inspection in the MSOB of the CSM-017 spacecraft wiring and plumbing, hundreds of discrepancies internal to the flight hardware were uncovered. At this time, it became obvious that moving the AS-501 stack to Launch Complex 39A (LC-39A) would not happen in the immediate future. In the months ahead the CSM-017 problems uncovered were repaired consistent with redesign, and with new wiring and plumbing installation criteria which had evolved. Wiring and plumbing evaluation and rework of CSM-017 continued in the MSOB into early June. In late May 1967 an off line S-II tank inspection in California identified a hairline crack in the seams of an S-II propellant tank which subsequently raised an ominous cloud over all tanks. This concern necessitated removal of the S-II-1 stage. After the stage was de-mated from the S-IC, a tank dye penetrant test and internal tank inspections were initiated in the VAB low bay. In mid-June 1967 the S-II-1 tank internal inspections were completed in the VAB and the tanks passed with flying colors. Shortly afterwards, the CSM-017 rework effort was completed in the MSOB and preparations were completed to move it back to the VAB. From October 1966 through late June 1967, much valuable AS-501 ground processing operational time was lost while the CSM and the S-II-1 stage struggled with their respective problems. The final AS-501 launch vehicle stacking operation was completed on June 19, 1967. As each stage was mated, vertical alignment was confirmed for the last time on this vehicle.



Jesse Owens Photo

The LC-34 "White Room" Close Out Crew (before the Apollo 1 fire). Front row, left to right: Don Babbit, Pad Leader; Gus Postreich, CM Tech; Jesse Owens, Flight Test Engineer. Back row, left to right: Jerry Holsclaw, CM Tech; John Jurlina, CM Q.C.; O.D. Harr, NASA Q.C.

North American Rockwell Apollo Team Leadership

As a consequence of the AS-204 fire, management changes deemed necessary were initiated both within the NASA and the NAA CSM organizations. George Low replaced Joe Shea as NASA Apollo Spacecraft Program Manager at the Manned Spacecraft Center (MSC) in Houston. In March 1967, North American Aviation and Rockwell Standard merged to become North American Rockwell (NAR). Bill Bergen, previously with the Martin Company, assumed the role as the new President of the NAR Space Division replacing Harrison Storms. Buz Hello, also from the Martin Company, took over as NAR Vice President of Apollo Launch Operations at KSC responsible for the management of nearly 2,500 employees. Also from the Martin Company came G.T. Wiley as an advisor to Buz and John Healey who assumed a new position as the NAR Block II CSM-101 Spacecraft Manager, with overall vehicle management responsibility for the spacecraft from manufacturing through launch. During subsequent years of the Apollo Saturn V program, this responsibility for future spacecraft was continued and assigned to other members of management, i.e., Joe Cuzzupoli, Ray Larson and Bud Benner and to other members of the CSM Project Office.

Apollo CSM NAR Launch Operations – Shortly after his arrival at KSC, and while fallout from the investigation was still being absorbed and implemented, Buz identified the roles and responsibilities of the key players in his new organization at KSC. T.J. O'Malley, formerly a Project Mercury test conductor with General Dynamics, was identified as



NASA Photo

Thomas J. O'Malley in the LC-14 blockhouse during a Project Mercury launch.

the new NAR Director of Apollo Spacecraft Operations. Shortly after their arrival at KSC, Buz and Tom agreed on some major organizational changes in an attempt to immediately strengthen the CSM launch team. The changes to the Apollo CSM Launch Operations organization affected both the assignment and responsibilities of the existing personnel and of the organizational structure. It also brought a few new faces on board in key positions. In late 1968, the NAR Apollo spacecraft employment was approaching 1,800 CSM employees. A major concern at that time, and an area that we continually addressed on Apollo and into the early Space Shuttle Program, was the need to employ new college graduates to keep up technologically with the new era that we were entering.

Apollo S-II NAA Launch Operations – Between the time that the S-II stage contract was issued in late October 1962 and mid-1965, much of the ground system development and site activation planning effort was accomplished by stage designers back in California while working their interfaces directly with the NASA and/or support contractors in Florida. In 1965, Charlie Murphy and Carl Scheuplein were among the first group of S-II employees to arrive at Cape Canaveral in support of the Apollo program. They were initially housed in Hangar S in proximity to the NAR CSM groups located in the Engineering and Operations (E&O) building or in Hangar AF. Their initial assignments were to prepare S-II site activation and stage process planning documentation. An increasing number of S-II employees came on board in 1965 and relocated to the VAB as part of "operation big move" in September and October. S-II personnel were initially located on one side of the VAB low bay and S-IVB and Instrument Unit (IU) personnel were housed on the opposite side. The S-IC working troops were all located in the VAB high bay. In late 1965 as construction of the VAB was nearing completion, a significant amount of "outfitting" and site activation work still had to be accomplished, especially in the VAB high and low bays and on the Launch Umbilical Towers (LUTs). As time passed and the S-II employment numbers increased, most new hires moved into the VAB but some of the S-II troops moved into trailers in proximity to the launch pad or to the LUTs. At the launch pad, much of the propellant servicing hardware was operated and maintained by NASA support contractors. Al Martin the manager of the NAR S-II organization assumed his responsibilities at KSC in late 1965. Al was a former World War II B-26 pilot, NAA test conductor on the Navajo Program at Cape Canaveral and Director of S-II Test Operations in Seal Beach during the early 1960s. By the summer of 1966, the NAR S-II employees, coming from the same pool of potential employees as the CSM, numbered close to 200 people. In late 1968 the S-II employment numbers approached 500.

Apollo Program Status, Summer 1967

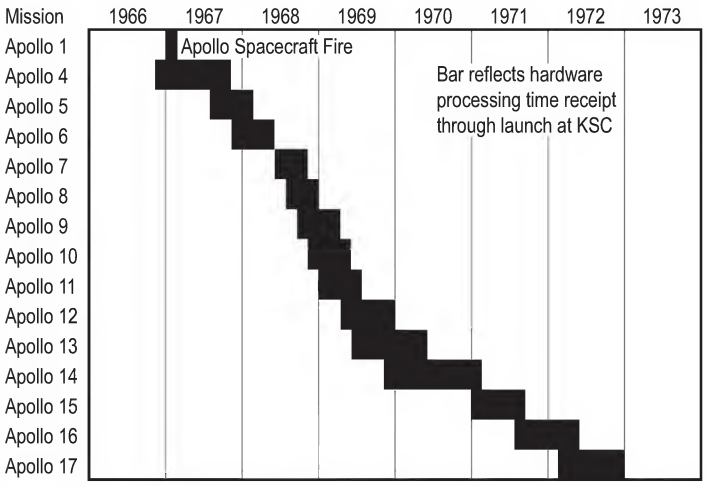
Ahead of us was the greatest technological challenge ever undertaken by man, and here we were with only three years in which to accomplish it and in big trouble. 1967 was a year of enormous frustration for the entire launch team as we were not only trying to recover from a tragic accident but also facing many new complexities and challenges. Each of the 1967 missions, originally planned as follow-on flights to that of AS-204, were cancelled after the CSM fire and explosion. There was no official Apollo 1, 2, or 3 flight missions flown. The mission name, "Apollo 1" chosen by the AS-204 flight crew in 1966, was officially retired by the NASA later in 1967 in commemoration of Astronauts Gus Grissom, Ed White, and Roger Chaffee at the request of the three astronauts' widows. At KSC in early summer 1967, CSM and S-II problems threatened, but did not extinguish the desire of the Apollo work force nor of the country to reach the lunar surface within the decade. Much depended on the outcome of the first Saturn V mission, on the performance of the Saturn V flight and ground system hardware and software and on the launch and mission support teams that were working together for the first time on the Apollo program. In Downey, Block II CSM spacecraft design, manufacturing and test activities were progressing quite well. Unresolved S-II system design, test, and manufacturing issues that had carried over into 1967 caused both Seal Beach and Huntsville personnel to be concerned that the S-II stage might become the long pole to program success. Johnson Space Center (JSC) remained concerned that CSM and LM weight increases, some dictated by the AS-204 incident, were still not under control. The most significant worry across the program was of the design immaturity exhibited by the LM. A flight version of the LM had not yet flown and ascent engine instability, landing gear, and radar system design problems still existed. On the other hand, the increased morale and confidence level, the "can do" and "will do" attitudes exhibited by the work force at KSC, at each of the prime contractor facilities and at each of the NASA centers across the country had become increasingly more obvious. In recognition of the accelerated progress being made on the program, yet with an element of concern that they not react too rapidly to meet or surpass our goal, NASA projected a new launch date for the AS-501 mission

of late October 1967. With that decision made, those of us on the program were given a new challenge at a time when programmatic funding reductions were imminent.

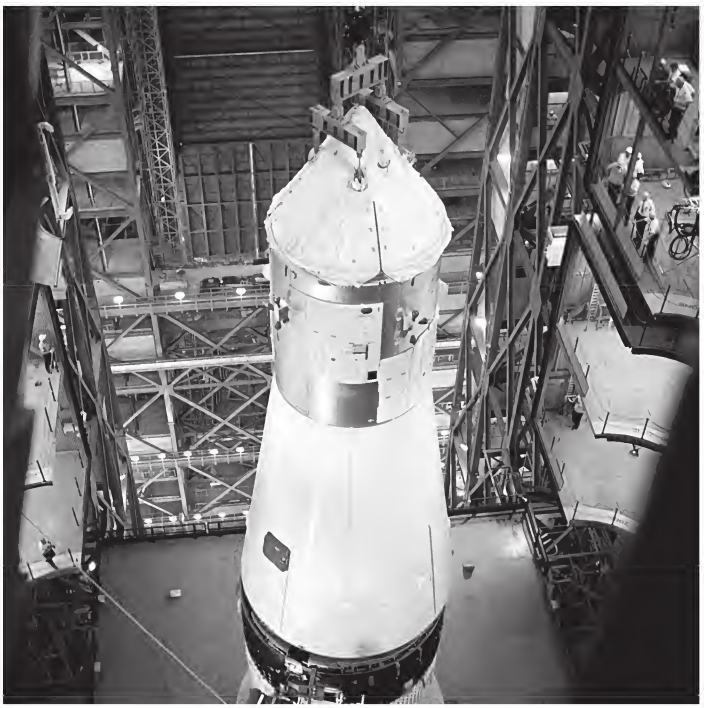
Apollo 4, 5, 6 Unmanned Development Test Flights

From early November 1967 when the U.S. launched the first unmanned Saturn V vehicle, until July 1975 when the single Apollo-Soyuz flight was initiated, the KSC launch team sent four unmanned and fifteen manned Apollo Saturn vehicles into space. Three of the unmanned flights were developmental in nature and positive flight test results were required from them prior to committing an astronaut to a deep space environment. Many of the technical changes identified during the AS-204 tragedy investigation were flight tested on the first three unmanned Saturn V Apollo 4, 5, and 6 missions. The fourth unmanned Saturn V vehicle carried the Skylab space station into orbit in 1973. Eleven of the manned missions occurred during the lunar landing program, including two test flights into low earth orbit, two lunar orbital flights, six lunar landings and one circumlunar flight which aborted. Three missions were cancelled in the latter stages of the Apollo Lunar program for lack of program funding. After completion of the lunar landing program, one unmanned and three manned flights were flown on the Skylab Program and one manned flight was flown on the Apollo-Soyuz program.

Apollo 4 (AS-501) Unmanned Launch Configuration – The launch of the Saturn V (AS-501) on the unmanned Apollo 4 mission was originally projected in 1963 to occur in March 1966. Due to hardware development problems, the date was later changed to April 1967. The launch was the fourth of six unmanned Apollo flights and the initial flight of the Saturn V series. The mission was designed to test many different aspects of the Saturn V launch vehicle and its compatibility with the Apollo spacecraft. The ground system schedule dictated the use of the same complement of ground test facilities for this launch as was used on the Facility Verification Vehicle (FVV) 500-F site activation operation in early 1966, i.e., VAB High Bay (HB-1), Mobile Launcher (ML-1), Firing Room (FR-1), Crawler-Transporter (CT-1), LC-39A, and the Mobile Service Structure (MSS). This was the first time that all flight elements of the Saturn V launch vehicle performed together. The Boeing S-IC-1 first stage



Apollo/Saturn Mission Summary October1968 - December 1972

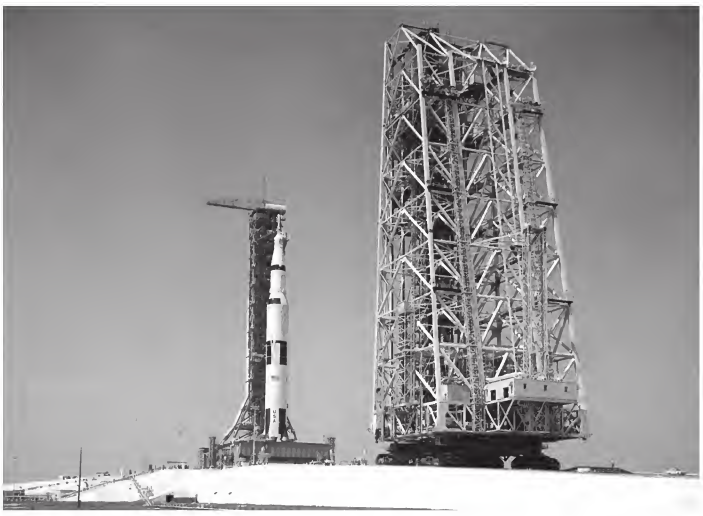


NASA Photo

Apollo CSM-017 is moved into position in the Vehicle Assembly Building's high bay area for mating with the Saturn V launch vehicle.

and NAR S-II-I second stage of the Saturn V had not been previously flown. The Douglas S-IVB-501 third stage design had flown previously as the second stage of the Saturn IB. The IBM IU-501 configuration was essentially the same design as had been flight tested during the Saturn IB flight test series. The AS-501 mission carried an unmanned NAA Block I Apollo spacecraft CSM-017 consisting of a CM, SM, LES, and a SLA. The Grumman 29,500-pound LTA-10R, was installed in the SLA to simulate the in-flight loads on the launch vehicle structure. The projected spacecraft weight at liftoff was 93,700 pounds. Of the 87 rocket engines flown on this Saturn V vehicle, Rocketdyne supplied 30 of them, including twelve small CM RCS thrusters to support CM reentry and six second and third stage propellant settling rockets. Five first stage F-1 engines provided 7,610,000 pounds of thrust, five second stage J-2 engines provided 1,150,000 pounds of thrust, and one third stage J-2 engine provided 230,000 pounds of thrust. The projected Saturn V space vehicle weight at liftoff was 6,121,466 pounds. In addition to the CSM Block I configuration flown on the AS-202 unmanned mission in 1966, the CSM-017 configuration included selected items of Block II hardware. As on previous unmanned flights, the mission control programmer (mechanical boy) was utilized to initiate/react to those in-flight actions that would normally have been provided by the flight crew.

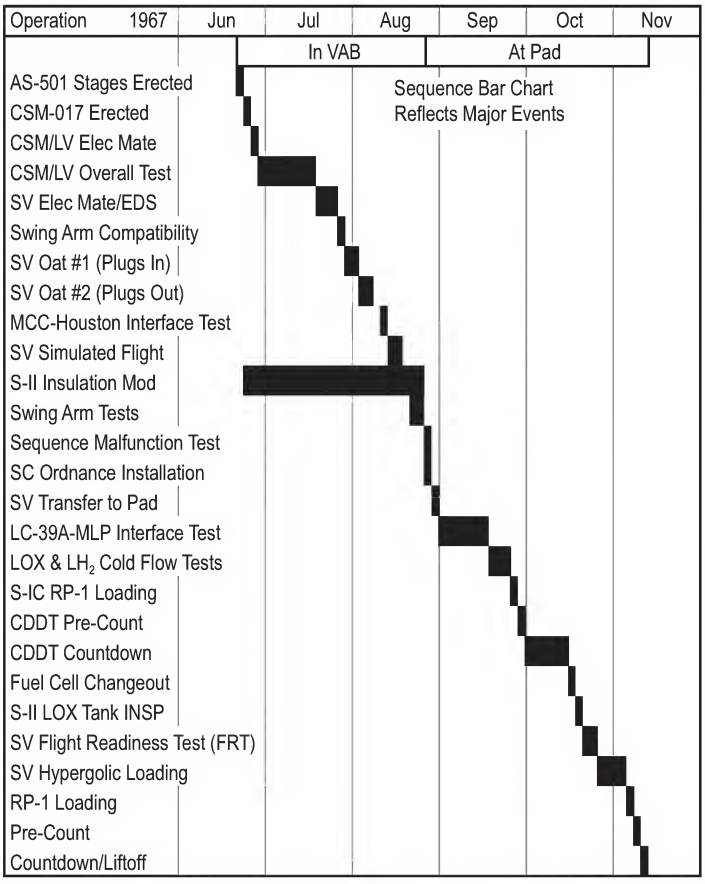
Apollo 4 (AS-501) VAB/Pad/Mission Operations – On June 20, 1967, the Apollo 4 spacecraft was transported to the VAB and structurally mated to the AS-501 launch vehicle. The Apollo 4 unmanned pre-launch processing sequence flow chart identifies the more significant test and operational activities performed in the VAB and at LC-39A in preparation for the launch scheduled for later in the year. Buried



NASA Photo

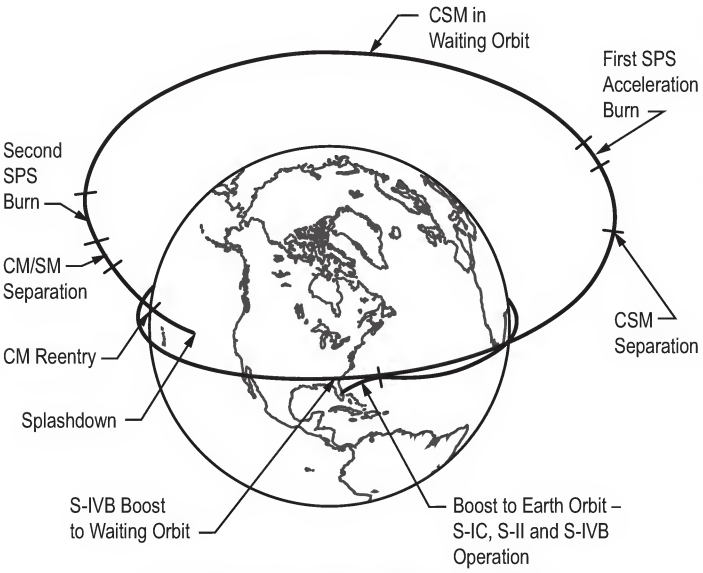
Mobile Launcher and Mobile Service Structure being positioned on Launch Pad.

within the Saturn V standard process flow plan are additional tests, i.e., swing arms, Emergency Detection System (EDS) and sequence malfunction that were safety unique to the Apollo Saturn V launch configuration. Upon completion of the more generic VAB test operations and prior to rollout, selected small ordnance items were installed, followed by the structural mating of the spacecraft Launch Escape System tower. In late August 1967, after a year of continuously interrupted vehicle processing and test activities in the VAB, each of the "stack" and Mobile Launch Platform (MLP-1) interfaces to the VAB were disconnected. Shortly afterwards,



Apollo 4 (AS-501) VAB/Pad Process Flow

the CT-1 carried MLP-1 and the Saturn V, AS-501 stacked vehicle to the launch pad. Upon arrival of the stacked Saturn V at LC-39A, MLP-1 was positioned above and then lowered and locked to the launch pad support pedestals and the MSS was moved from the park site to its pre-launch position surrounding the Saturn V vehicle. After the MSS work platforms were positioned to provide GSE and vehicle access, the launch pad interfaces to the "stack" and MLP-1 were connected and verified as operational. In the final weeks prior to the Launch Countdown, our intent was to complete the Countdown Demonstration Test (CDDT), and the Space Vehicle Flight Readiness Test (FRT) immediately prior to initiation of the Launch Countdown. Intermeshed throughout those major tests, as in the VAB, were the same safety critical tests and an RF compatibility test to verify that pyrotechnic circuits on the space vehicle could not be triggered by RF signals. The primary purpose of the CDDT was to exercise and evaluate the performance of the launch operations test team and the facility and ground fluid and mechanical systems hardware and software. The CDDT was an actual "dress rehearsal" of the countdown, both tasks and timing. When the countdown clock was stopped just prior to first stage engine ignition ending the CDDT, the entire launch team was exhausted and we were all given a day off. The Apollo 4 CDDT took 17 frustrating and exhausting days to complete. In that timeframe each stage experienced its own unique flight and ground system problems typical of a first time launch operation. The primary focus of the FRT at KSC was on the operation of the space vehicle electrical and electronic systems and subsystems. At JSC, successful operation of the Apollo Mission Control Center (MCC) and the world-wide communications network established to support an Apollo launch, mission, and recovery was the primary goal. During the FRT, the operational interfaces with the MCC Eastern Test Range Safety and down range support activities were active as though in support of a real launch and splashdown. The FRT proceeded without major incident. Prior to the planned liftoff, a simulated pad abort was initiated that was followed by a simulated Service Propulsion System (SPS) abort and by a successful simulated mission through splashdown. The Apollo 4 orbital mission was one in a series of increasingly complex missions focused on a lunar landing in less than two years. The launch pre-count was initiated on November 6, 1967. To provide contingency and crew rest time, two pre-planned clock holds were scheduled. The unmanned AS-501 liftoff occurred at 0700 on November 9, 1967. The giant S-IC first stage developed over seven and a half million pounds of thrust that shook the ground and the spectators three miles away at the press site as it lifted off from LC-39A. When the launch vehicle cleared the tower, control of the mission transitioned to the MCC in Houston. The launch was witnessed by tens of thousands of observers, hundreds of distinguished guests, newsmen from around the world, thousands of employees and visitors and a worldwide TV audience. At the time of launch, Brevard County received a not totally unexpected "jolt" upon the ignition of the five first stage engines—a real awakening to the Space Age. The sound was much stronger than anticipated as it buffeted the VAB, LCC and press buildings. The windows vibrated and ceiling tiles fell around newscaster Walter Cronkite, who was



Apollo 4 (AS-501) Mission Profile



NASA Photo

The Apollo CM-017, with flotation collar still attached, is hoisted aboard the* USS Bennington*, prime recovery ship for the Apollo 4 unmanned, Earth-orbital space mission.

covering the launch from the CBS News booth. Those of us working on the CSM launch team felt that we had been "cheated". Many of us (primarily engineers) were located in the MSOB ACE CSM control room at the time of launch, and missed all of the excitement. By 11 minutes after launch, each of the launch vehicle stages had completed their function and the CSM/S-IVB was in an earth parking orbit. Three hours later, the second firing of the S-IVB engine lifted the spacecraft to an altitude of 10,000 miles. After separation from the S-IVB, the Service Module engine was fired to increase the CSM altitude to 11,000 miles and oriented the spacecraft to place the CM heat shield in shadow. After a four-hour cold soak period, the CSM was propelled by the SPS engine back towards earth aimed at a point over the Pacific Ocean near Hawaii. The CM was separated from the SM as it attained a speed of over 25,000 mph, to simulate the high-speed reentry of the earth's atmosphere that would occur on the return flights of the spacecraft from the moon. On November 9, 1967, after an extremely successful nine-hour flight, CM-017 descended on its parachutes into the Pacific Ocean and was recovered by the *USS Bennington.* The AS-501 mission had a large number of primary objectives applicable to both the launch vehicle and to the spacecraft each of which were met. Of special significance was the requirement to demonstrate integrity and compatibility of the launch vehicle and spacecraft and normal separation of the flight stages. A very slight "pogo" bounce was observed during the firing of the second stage J-2 engines. The successful test of the CM heat shield while in a lunar return orientation was a significant accomplishment. The mission was deemed a complete success and a giant step forward for the Apollo program toward its goal of landing men on the moon by the end of the decade. The mission demonstrated the readiness of the facilities and of the ground operations, mission support and recovery teams necessary to support the Apollo program. Of special note was the performance of the teams located around the world that supported MCC, the MSFN and the DOD Manned Spaceflight Support Office. Launch damage, while extensive in isolated areas (LUT level platform was completely destroyed and the engine service platform was damaged extensively) was, in general, less than expected. Success of the Apollo 4 mission validated a controversial decision made by Dr. George Mueller in 1963. His decision dictated use of "all up" space vehicle (Saturn IB, Saturn V and Apollo spacecraft) in-flight testing in lieu of incremental, stage by stage, subsystem by subsystem testing previously used in launch vehicle testing. This decision not only saved time and money (the biggest bang for the buck), but also provided the best opportunity to make a lunar landing prior to the end of the decade.

Apollo Program Mission Type Identification – While the Apollo 4 flight hardware was being processed at LC-39A in September 1967, JSC continued to evaluate the various mission options that might increase the probability of Apollo reaching the lunar surface prior to the 1970 goal. Late in the month, Owen Maynard and his NASA Systems Engineering organization in Houston presented an operational scenario to program management that he believed could conceivably lead directly to a manned lunar landing before the end of the century. Seven different types of missions (Type A-G) were proposed for implementation. Performance of each mission type would be evaluated while considering the mission objectives, a specific list of priority tasks to be performed in flight, and accomplishment of hardware, software and mission operational requirements. The plan specified that each serial mission step must be completed successfully before the next mission Type could be undertaken. Although a final decision on the lunar orbital mission scenario was not made until later in the year, the seven-step plan was generally adopted throughout NASA. In the following months, the plan was approved and modified slightly to provide for an early lunar voyage, Apollo 8 Type C' and for more advanced lunar landing missions 12-17 Types H-J.

Mission	Launch Date	Launch Vehicle	LV Serial No.	Mission Type	Configuration
Apollo 4 Apollo 6	11/9/1967	Saturn V	AS-501 AS-502	A	Unmanned Earth Orbital
Apollo 5	1/22/1968	Saturn IB	AS-204	B	Unmanned Lunar Module Evaluation
Apollo 7	10/11/1968	Saturn IB	AS-205	C	Manned CSM Earth Orbital
Apollo 8	12/21/1968	Saturn V	AS-503	C'	Manned CSM Lunar Orbital
Apollo 9	3/3/1969	Saturn V	AS-504	D	Manned CSM/LM Earth Orbital
Cancelled				E	Earth Orbital Manned CSM/LM Augmented Type Objective
Apollo 10	5/18/1969	Saturn V	AS-505	F	Manned CSM/LM Lunar Orbital
Apollo 11	7/16/1969	Saturn V	AS-506	G	Manned CSM/LM Lunar Landing
Apollo 12 Apollo 13 Apollo 14	11/4/1969 4/11/1970 1/31/1971	Saturn V	AS-507 AS-508 AS-509	H	Lunar Landing
Apollo 15 Apollo 16 Apollo 17	7/26/1971 4/16/1972 12/7/1972	Saturn V	AS-510 AS-511 AS-512	J	Lunar Landing

Apollo flights after Apollo 1, prior to program termination.

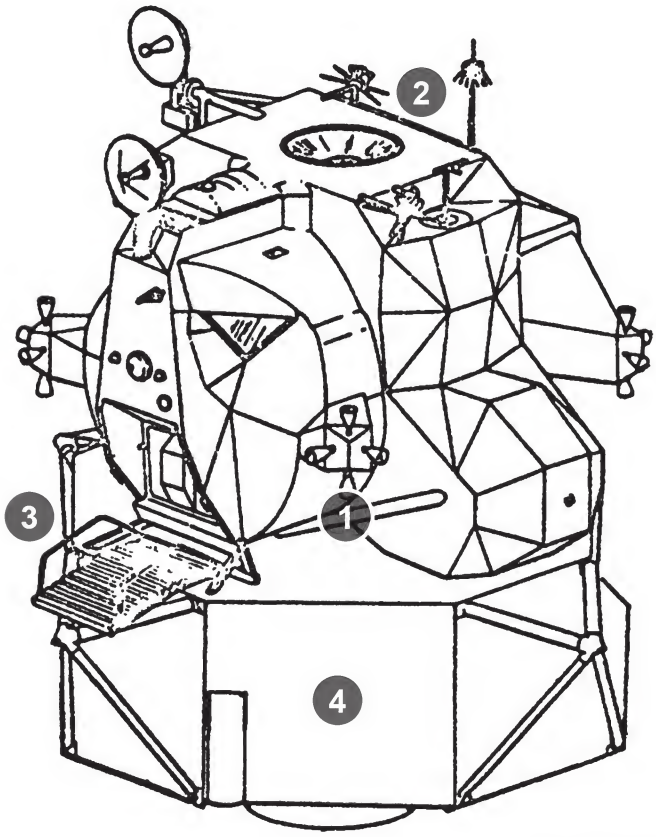
Apollo 5 (AS-204) Unmanned Type B Mission – As the new year began, the launch team had recovered much of the schedule time believed lost due to the January 1967 incident at LC-34 and an ambitious schedule had been set up for 1968. Surveyor planned to photograph the lunar surface and analyze the lunar soil in January, followed by a flight of Apollo 5 with LM-1 on a Type B mission later in the month. The program anxiously looked ahead several months to the Apollo 6 mission, a repeat of the Type A Apollo 4 flight and the final qualification flight of the Saturn V. If both Apollo 5 and 6 missions were successful the Apollo Program Office planned to advance the manned Apollo 7 mission into July or August. Should either Apollo 5 or 6 fail to meet its objectives, alternate plans provided for an additional LM test flight on a Saturn IB or on a third unmanned Saturn V mission. Apollo program employees could look back on 1967 as a year of significant accomplishment (in spite of the unfortunate setbacks) and to a year ahead that required a continued dedication and work ethic while programmatic budgets were, diminishing. In l962, Grumman received a contract from NASA to design and to build the Lunar Excursion Module (LEM), later renamed the Lunar Module (LM). In response to the requirements for access to the lunar surface utilizing the Lunar Orbit Rendezvous (LOR) mode of accessing the moon, the Lunar Module was designed to have two stages. The Descent Stage would provide the capability to propel two astronauts from an orbiting CSM to the lunar surface and after an undefined stay the Ascent Stage would provide the capability to return the astronauts to the orbiting CSM. During discussions of Lunar Module configuration throughout the first years of the contract, NAA, Grumman and NASA agreed that the Spacecraft Lunar Adapter, a truncated cone structure 345 inches long, would house the LM and that NAA would assume technical and manufacturing responsibility for it. This configuration provided ample clearance for the LM spacecraft between the Service Propulsion System (SPS) engine bell and the S-IVB/IU interfaces. Additional agreements stated that the LM would be enclosed by the interior walls of the SLA and held rigid by the LM landing gear outrigger struts and that NAA would assume technical responsibility for the CSM/LM docking probe and drogue sub-system. These significant decisions on the Apollo Program, which were quite beneficial to NAA, helped cement a cordial working relationship between Grumman and NAA that continued over the Apollo years. Although a LM configuration "freeze" was established in April 1963, the configuration of the LM was not finalized nor did major subsystem development begin until late 1964. The late start of the LM design has been identified as a contributing factor to the continued schedule problems experienced over the first few years of Grumman involvement. As the program developed, excessive weight within the LM became a serious problem. Grumman continually searched for weight reduction candidates. Many of the weight saving changes made the LM so fragile and vulnerable that great care on the part of the assembly and checkout technicians was required to prevent damage. In May 1963, Rocketdyne was selected as the contractor to develop the LM descent engine. Shortly afterwards, because the descent engine development was considered to be the largest LM technical problem at that time, a second source contractor, Space Technology Laboratories (STL) was selected to develop and fabricate the mechanically throttled descent engine. The competition for the descent engine contract continued until early January 1965 when the Rocketdyne contract was cancelled and STL was given the prime contract. In February 1964, the Bell Aerosystems Company was awarded a contract to develop and assemble the LM ascent engine. As the Apollo 5 mission approached in late 1966 it was agreed that the Bell ascent stage engine would be acceptable for use on the LM-1 unmanned flight, but its use was questionable for manned flight. In 1967, Rocketdyne was given a role as an ascent engine injector backup development contractor and in September 1968, Program Management decided that the ascent engine to be flown on LM-3 and subsequent lunar missions would incorporate the Rocketdyne injector. Shortly afterwards, Rocketdyne was given contractual responsibility to assemble and to deliver the RS-18 ascent engine under subcontract to Grumman. AS-204 was



NASA Photo

The Spacecraft Lunar Module Adapter was initially transported by helicopter to the operational sites.

the launch vehicle originally scheduled for the flight of Grissom, White and Chaffee. The AS-204 Saturn IB stages had been at the Cape and stacked on LC-34 since August of 1966. In March 1967, after the Apollo fire, the AS-204 stages were removed from LC-34 and inspected for corrosion and for any other damage they may have sustained during the long stay on the pad. When it was decided that AS-204 was in good shape and with the Apollo 5 mission in need of a launch vehicle, it was selected to do the job. On April 11, 1967, the AS-204 launch vehicle stages were stacked on Launch Complex 37B to await its payload. Delivery of the first flight configured Lunar Module (LM-1) to KSC was initially expected in late September 1966. LM-1 arrived at KSC on June 23, 1967 aboard the Aero Space Lines "Super Guppy", nine months later than initially planned. From the time of receipt of the LM-1 flight hardware, Grumman personnel at KSC suffered the pains associated with first time processing of complex flight hardware just as NAA personnel had done back in 1966. In October, test and checkout of the Ascent and Descent stages was completed and the stages were mated. The overall LM-1 unmanned configuration varied slightly from that of the manned lunar configuration. A major addition included the use of a LM Mission Programmer (LMP) to perform functions normally controlled by the crew. LM-1 was not going to land on the lunar surface on the Apollo 5 mission, consequently, it did not require any supporting legs. After completing LM-1 integrated checkout and cabin leak checks in the MSOB, the spacecraft was inserted into and connected to SLA-7. In November the Apollo 5 payload was carried to LC-37B and mated to the SA-204 launch vehicle. With no CSM on this mission, the nosecone was mated to SLA-7 enclosing the first lunar module flight test article in an aerodynamic shroud that would next be opened while in orbit. The primary objectives of the launch vehicle on Apollo 5 were to evaluate the S-IVB and IU orbital performance and to demonstrate nosecone separation. For the first time, LM-1 was in the spotlight. Operation of the majority of the LM-1 sub-systems in space was planned and the first firing in space of the Ascent and Descent stage engines would be attempted. In so doing, the capability of the Ascent stage to react to an abort condition and to fire while still attached to the Descent stage would be confirmed ("fire in the hole"). Ground operations at LC-37B followed a launch pad test scenario similar to that performed in support of previous Saturn IB flights. They conducted stage and module unique tests followed by launch vehicle integrated tests and then proceeded into CDDT, FRT, and Countdown. Apollo 5 was launched on January 22, 1968 on a Type B LM development mission. Once the vehicle was in orbit, the nose cone was jettisoned and SLA panels deployed as on a lunar mission, exposing the spacecraft. After LM-1 was separated from the S-IVB/IU, it was maneuvered to a cold soak attitude for three hours and then was positioned for the first of three descent engine firings. On the first try, the descent engine performed as expected although the first descent burn was cut short due to a software problem. Prior to the completion of the third descent burn, a "fire in the hole" test simulating an abort condition was initiated. When that occurred, the LM-1 Ascent and Decent stages separated, and the ascent engine fired.



NASA Illustration

LM-1 Vehicle with the Ascent Stage (1), Docking Hatch (2), Egress Platform (3), and Descent Stage (4).



NASA Photo

Apollo 5 (AS-204) on Launch Complex 37B

Simultaneous with those events, the descent engine shut down, a textbook performance. A second ascent engine burn was performed later in the mission. The successful mission was essentially completed after four orbits. By February 12, 1968 both stages had fallen into the Pacific Ocean. Telemetry data to the ground confirmed that all S-IVB and IU interfacing systems and LM-1 flight subsystems operated properly during the mission and that all mission objectives were satisfactorily completed. Immediately following the Apollo 5 success, NASA Headquarters decided not to plan another unmanned LM Type B mission. They believed that if the launches of Apollo 6 and Apollo 7 were successful, the first lunar module to carry men could be launched by a Saturn V before the end of 1968 although the chances appeared to be quite slim.

Apollo 6 (AS-502) Unmanned Type A Mission – The Apollo 6 AS-502 flight was the last of the Apollo/Saturn series of unmanned flights and the second Saturn V flight. Following on the heels of Apollo 4 and 5, the unmanned Apollo 6 Type A mission was designed to be the final qualification test flight for manned operations of the Saturn V launch vehicle. The flight of AS-502 carried Block I CM-020 and SM-014 (when combined referred to as CSM-020) and Lunar Module Test Article, LTA-2R. The mass and shape of the Grumman structural test article was similar to that of their flight hardware. The major CSM differences from the Apollo 4 spacecraft found the Emergency Detection System (EDS) flying "closed loop" with an automatic abort capability, a unified quick opening crew hatch, and an upgraded Environmental Control System (ECS) controller. In the LTA, the landing gear was installed in the retracted position. The Launch Complex 39 facility plan to support the AS-502 flow included use of the previously unused VAB HB-3, FR-2 and MLP-2. The first and third stages of the Apollo 6 vehicle along with the IU were available at KSC in mid-March 1967 with delivery of the S-II stage projected for late May. As a consequence of the late S-II delivery, it was decided to once again use the S-II "spacer". Fallout of the AS-204 investigation had a large impact on the delivery of CSM-020 to KSC as did the installation of Block II improvements to the vehicle. The consequence of the rework in Downey resulted in a projected late September delivery date to KSC. The late delivery again led to the use of the CSM FVV as a substitute for the CSM. The initial mating of the AS-502 stack was completed in late March 1967. The activation of a new set of facilities and associated ground hardware while three flight vehicles were being processed simultaneously caused a large manpower drain through the summer months. "Outfitting" and modifying each of the facilities with their respective swing arms, hold downs, tail service masts etc., was a massive task. The S-II stage replaced the spacer on the stack in early July. CM-020 and SM-014 arrived at KSC in late September with very little open work, i.e., a "clean bird". While in the MSOB, the CM and SM maintained their schedules quite well and continually improved on that of their predecessor, CSM-017. After mating with the SLA-9/LTA-2 combination, CSM-020 replaced the CSM FVV in the VAB stack on December 10, 1967. Although we suffered a few additional problems during the VAB processing flow, the hardware and the team performed quite well. Apollo 6 was transferred to LC-39A on February 6, 1968. Launch pad operations proceeded quite well with very few significant problems during the process. After a successful Flight Readiness Test, space vehicle propulsion system leak test and hypergolic loading, and a CDDT, the AS-502 countdown was initiated. The Apollo 6 mission was successfully launched on April 4, 1968. The primary mission objectives were a mirror image of those on Apollo 4 with the addition of an evaluation of the closed loop EDS. The 10-hour long mission plan was to demonstrate the lunar injection capability of the Saturn V to send an Apollo spaceship to the moon, to abort the mission and then to return the CM directly to earth while withstanding the thermal environment of a lunar reentry. A secondary objective of the mission was to validate proper operation of selected critical CSM subsystems. Apollo 6 experienced three major problems during its flight. During the first stage engine burn, the vehicle experienced longitudinal oscillations called "pogo" which caused unacceptable "g" loads in the CSM/SLA structure. During the S-II second stage burn, two of the five S-II J-2 engines shut down early, forcing the other three engines and the S-IVB engine to pick up the "slack" to get the S-IVB and CSM into the proper orbit. While in orbit, the S-IVB engine failed to restart. As a consequence, and much like Apollo 4, the SPS engine was used to drive the spacecraft back into the earth's atmosphere but for lack of sufficient fuel didn't attain the velocity necessary to satisfy the mission objective. Post-flight analyses of each of these problems identified the cause and in each case a simple fix. With the use of a workaround, the mission was successfully completed but some of the more significant objectives of the mission were not realized. The Apollo 6 spacecraft was recovered successfully on April 4, 1968 from the Pacific Ocean by the *USS Okinawa*. With an in-flight workaround utilizing the SPS engine, the mission was saved, although some of the more significant objectives of the mission were not totally realized. As a result, the Apollo 6 mission was classified as a partial success. There was very little press coverage of the Apollo 6 mission due in part by the fact that five days earlier, President Johnson had announced he didn't intend to run again for President. In Memphis, Tennessee, on the day of the launch, April 4, 1968, Martin Luther King, Jr. was shot and killed.

Apollo Manned Development Test Flights 7-10

Despite the launch vehicle engine failures on Apollo 6, the two Saturn V Type A flights provided sufficient confidence in the design and operation of the launch vehicle to consider it ready for manned flight missions. The LM success on the Apollo 5 Type B mission was a step in the right direction, but we still had a long way to go with its development. Ahead of us we needed successful flights on the four Type C, D, E, and F missions and we hadn't yet successfully flight tested either the CSM or the LM designs that we intended to fly there.

To Be Continued

About the Author: During his 34 years with NAA/Rockwell, Bill served on the Apollo, Space Shuttle, and Space Station programs in a supervisory or management position. Half of that time was dedicated to Apollo and Space Shuttle launch operations at KSC. Since his retirement in 1996, he has served as an aerospace consultant. Bill currently resides in Newbury Park, California with his charming wife of 53 years, Penny.

Apollo Snapshots

by Dave Levine

The 8-Ball

As designs matured for the Apollo Command Module, weight estimates began to grow. NASA appointed a team from Houston to work with the Contractors on weight reduction. North American Aviation was asked to examine using pitch and roll needle indicators for attitude display-which would require sequential rolling and then pitching to reach the desired attitude. We came up with the cost as well as the weight savings as compared to an 8-Ball, but we were concerned about the crew getting disoriented in emergency situations. There were opposing views at NASA and no resolution. Bob Gilruth had recently moved to Texas to head up what was to become the NASA Johnson Space Center and had his temporary offices in the Houston Oil Center buildings, south of the city. Max Faget called a meeting with Dr. Gilruth to end the impasse. I was there, representing NAA. After listening to the arguments for a few minutes, Dr. Gilruth cut the meeting short and resolved the issue by saying, *"Every good spaceship should have an 8-Ball!"* And, he left the room.

Integrated Guidance & Control

As associate contractors with separate areas of responsibility, the Stark Draper Lab at MIT was developing a triply redundant magnetic-core-memory digital computer system for guidance and navigation. Back-up navigation was to be provided by our NAA telecommunication system and the IBM 360 computers at NASA/JSC. We at NAA, with Honeywell as our subcontractor, were developing the quadruple redundant analog computer system for stability and flight control. The redundancy was dictated by the requirement to be "fail operational, fail operational, fail safe" or fo,fo,fs. In other words, no two failures in a system would abort the mission, and the crew could return safely after a third failure. The net result was to have a lot of heavy, cold-plate cooled boxes in the Lower Equipment Bay of the Command Module.

Dr. Gilruth brought in Cliff Duncan, on temporary assignment to JSC, to evaluate the combined systems. He formed a team consisting of myself from NAA, supported by Bill Fouts and the G&C Group at Downey, and Davey Hoag from MIT, supported by the Draper Lab. We developed the concept of: primary navigation on the ground via telecommunications and JSC computers with back-up via MIT's onboard system; the primary guidance and control via MIT's redundant onboard digital system with backup via Honeywell's single analog computer. The entire concept was an integrated guidance, navigation and control system that met the "fo,fo,fs" criterion and eliminated three black boxes from the Command Module.

But, the concept was unproven. In the early 1960s, digital computers had random access memories limited to kilobits and processing speeds were well under a megabit per second. We were concerned about the effect of the iteration rate on dynamic stability and the competition of stability and control with guidance functions in the computer. We gave MIT the flight control equations to program into their computers, and they, in turn, gave us a computer to evaluate in our Flight Simulator. The concept worked, and we were given letters of commendation by the NASA.



The Moon Walker

Astronaut Dave Scott and his wife, Lurleen, were living in Manhattan Beach after Dave retired from NASA and I had retired from Rockwell. Lurleen was working in the Hollywood Riviera Village of Torrance together with a friend of mine. My friend knew that I had worked with Dave, shortly after his Gemini docking mission, when he was assigned to overview one of the Apollo electronic subsystems. A wonderful cook from New Orleans, my friend and her husband had a dinner party for the Scotts, my wife Linda and me. Linda sat next to Dave and I sat next to Lurleen. We talked a bit about our activities in Downey but not really about the Gemini or Apollo missions.

Driving home after a great evening, I asked my wife how she felt sitting next to a guy who had walked on the Moon. She answered, *"What! He walked on the Moon?"* I couldn't believe what I had heard, and probably said something about her lack of knowledge. Linda was embarrassed. So, the next morning she called to thank our hostess, she acknowledged her embarrassment and told the story. Our hostess who had not met Dave before that evening exclaimed, *"What! He walked on the Moon?"*

About the Author: Dave joined NAA in 1953 after serving aboard a destroyer in the Korean conflict. He accompanied Harrison "Stormy" Storms to Downey when the Missile Division was redesignated the Space & Information Systems Division. He was manager of the Electrical and Electronic Systems Group for development of the Apollo CSM and led a support team to NASA Mission Control during the Apollo missions. This included the successful effort to safely recover the Apollo XIII crew. He performed a similar managerial role on Space Shuttle before retiring in 1984. Dave currently resides with his charming wife, Linda, in Palm Springs, California.

The North American Aviation MX-770 Project – Part I

by Dave Stern

Editor's Note : Again, it is a pleasure to provide another article by our aviation history sleuth, Dave Stern, salvaged from the darkened and dust covered catacombs of the National Archives. It is particularly pleasing because it provides the initial foundation in the establishment of three of the most productive organizations in the history of mankind: the Space, Autonetics and Rocketdyne Divisions of North American Aviation, Inc.

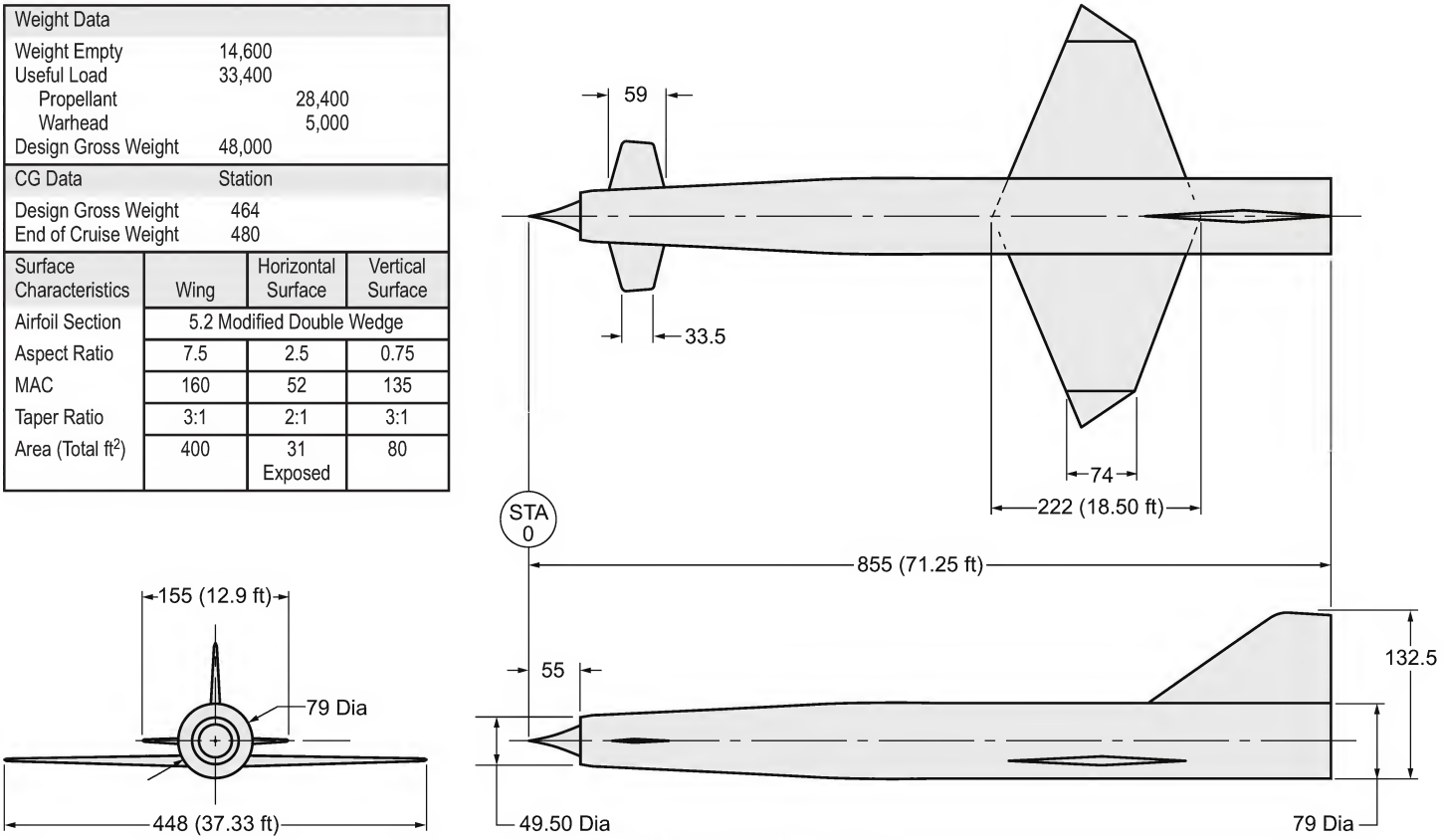
As World War II ended, tons of German research data and physical missile and rocket hardware were shipped to Wright Field and Freeman Field in Indiana under the aegis of the USAAF Air Material Command. As North American Aviation management considered entering the guided missile business it was inundated with dozens of requests for guided missile projects from the USAAF, Navy Bureau of Aeronautics and the Navy Bureau of Ordnance. While the Army Air Force downsized personnel and hardware and entered divorce proceedings from the Army, NAA management decided to maintain relations with the USAAF cum USAF and concentrate on their guided missile programs. On April 1, 1946, North American Aviation entered a new era in aeronautical and aerospace technology by initiating a one year USAF research study leading to a 175- to 500-mile range supersonic tactical guided missile carrying a 2,000-pound HE warhead.

This was "Air Material Command MX-770" Army Air Forces Contract number W33-038-AC-14191 and valued at $2,307,578. NAA hired Dr. William Bollay, a Dr. Theodore von Karman alumnus, to guide the MX-770 project as director of the Aerophysics Laboratory. His Deputy Assistant was E.M. Redding with C.W. Guy, and Administrative Assistant, R.K. Holbrook. The Aerophysics Laboratory Chief Engineer was R.H. Rice. With zero guided missile and rocket engine experience, NAA agreed with the Air Force project manager, that a single contractor, i.e., North American Aviation would accept full responsibility for the entire development and all components comprising MX-770. Management and engineers exercised keen intelligence and insight by dividing MX-770 into four major segments—Preliminary Analysis, Guidance, Propulsion, Aerodynamics and Missile Design. The engineering team initially considered three possible configurations; an A4b glide-rocket with wings, a glide-rocket with triangular wings and a winged ramjet missile.

In 1946, the MX-770 team petitioned the USAAF Air Material Command at Wright and Freeman Fields, to loan German documents, drawings, and interrogation reports concerning the V-2 rocket for analysis, including hardware such as a complete A4 (V-2) rocket (one intact A4 was provided by Cal Tech's JPL facility) to disassemble the propulsion system and then improve and "Americanize" it.

Further requests included six V-2 rocket engines with detailed drawings, German fuels research, samples of the ME-163 Komet's Walter 109 rocket engine and turbo-pump. Aerophysics Laboratory also secured several A4 SG-66 stabilized platforms (path governors), to reverse engineer. Other material included Wagner integrating cells, data on the "Viktoria" missile guide beam system, and German Type I and Type II accelerometer units borrowed from Naval Ordnance Test Station, Inyokern, California, and White Sands Proving Grounds.

Weight Data			
Weight Empty	14,600		
Useful Load	33,400		
Propellant		28,400	
Warhead		5,000	
Design Gross Weight	48,000		
CG Data	**Station**		
Design Gross Weight	464		
End of Cruise Weight	480		
Surface Characteristics	**Wing**	**Horizontal Surface**	**Vertical Surface**
Airfoil Section	5.2 Modified Double Wedge		
Aspect Ratio	7.5	2.5	0.75
MAC	160	52	135
Taper Ratio	3:1	2:1	3:1
Area (Total ft^2)	400	31 Exposed	80



Ramjet Missile – Three View

Initial design possibilities relied upon the chosen propulsion system to attain high-speed cruise flight. If turbojet powered, it must propel MX-770 to Mach 1.0 to 2.0 cruise speeds. Second choice was ramjet propulsion for supersonic cruise requiring a rocket booster to accelerate the missile so its ramjets could air-start. This would require the development of two unrelated propulsion systems.

NAA engineers initially proposed an "Americanized glide-rocket" derived from the winged A4b. Two were flight-tested at Peenemunde in December 1944 and early 1945. NAA engineers repositioned the A4b's swept wings further aft, enlarged the tail surfaces, and refined its structural efficiency to glide at Mach 6.4. Prior to NAA wind tunnels becoming operational, early missile models were tested in the Ordnance Aerophysics Laboratory in Dangerfield, Texas. Engineers explored 11 full-wing planforms and 18 wing-body combinations some with lineage to German research and their supersonic Zitterrochen missile, a handsome near diamond shaped wing planform—a modified version was applied to the F-106A and B-58 Hustler wings.

To develop MX-770 and future missiles, NAA created the Technical Research Laboratory that split into the Astrophysics Laboratory, and the Santa Susana Field Laboratory rocket propulsion test stand, with the USAF providing related equipment. For their aerodynamic research NAA constructed a small 50-square centimeter supersonic wind tunnel (to Mach 3.0), followed by a larger supersonic tunnel (to Mach 5.0) with a 16-inch by 16-inch cross-section; it was based upon the captured German Kochel blow-down tunnel, which the Navy had dismantled and shipped to Maryland. The USAF authorized $287,000 in capital funds so the tunnel could be completed in October 1948.

NAA agreed with the USAF to construct sixteen RTV-A-3 NATIV (North American Test Instrumentation Vehicle) missiles in two series (unstabilized and guided). The USAF Air Material Command loaned NAA blueprints and data on the German Wasserfall interceptor missile from which NATIV was derived, but minus the mid-fuselage stub wings—they were launched at Alamogordo Army Air Base (cum Holloman AFB), New Mexico. NATIV was propelled aloft by one 2,600 pound thrust Aerojet acid-analine rocket motor.

One unmarked mimeographed NAA document proposed modifying the RTV-A-3 into the reconfigured RTV-A-5 an air-launched cruise missile; one J-40-WE-1 turbojet engine, hopefully cruising at Mach 1.8 and an advanced RTV-A-5 version utilizing an uprated J-40-WE-10 engine which would cruise at Mach 2.8.

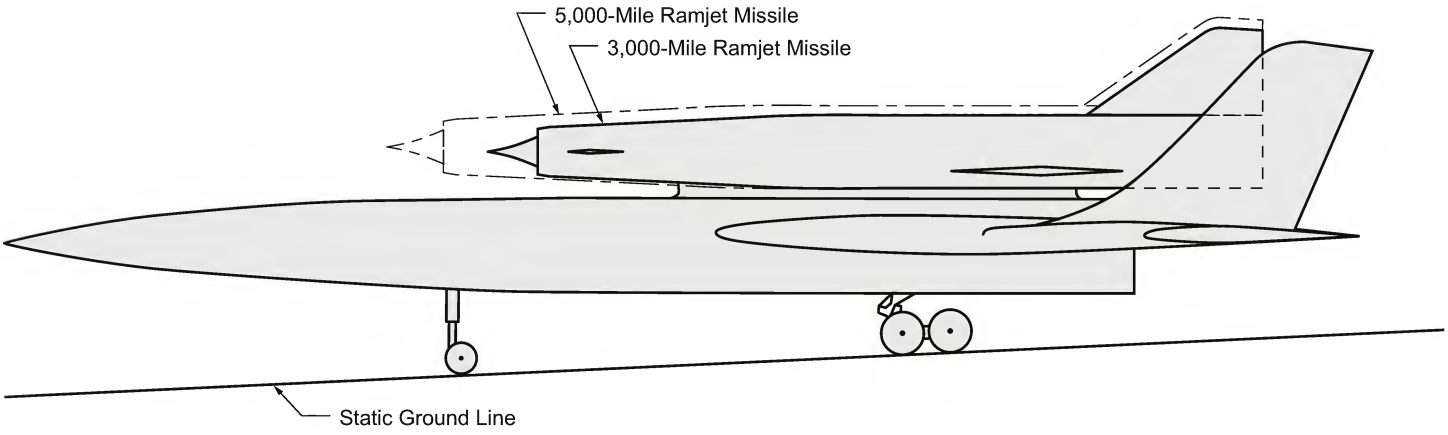
One missile carried under a Boeing B-50 or Convair B-36 bomber would launch the RTV-A-5 approximately 150 miles from enemy borders. Mission-specific B-36 bombers were required to penetrate at least 100 miles into northern Siberia before launching the missiles—only if they remained undetected by Soviet air defense interceptors.

In 1947, the USAF extended MX-770's range to 1,000 miles. Multiple engineering proposals included a single ramjet powered canard missile semi-recessed within a B-36 bomb bay; other variants were self-guided robot F-86 Sabre and B-45 Tornado aircraft minus canopies, and human cockpit accoutrements, thus being much lighter in weight. From many unusual configurations NAA engineers chose a ground launched rocket boosted XSSM-A-2 missile, carrying a 2,000-3,000-pound warhead 1,025 miles at Mach 2.8 at 80,000 feet. Cruising thrust was generated by two unidentified and non-existent 36-inch diameter ramjet engines (projected thrust of 3,500 pounds each).

Number 18-8 Stainless Steel would comprise the body of the missile but also included other standard aircraft metals. Various launch schemes for XSSM-A-2 and other configurations included cargo-ship launch, "split-cannon" launch from a totally flat decked carrier minus the "island," and rocket powered sled launches. Most unusual was a vertically launched XSSM-A-2 missile. A huge helium filled balloon lifted the MX-770 aloft tail-first and nose-down from a moving railroad flat-car, to a pre-determined altitude before the rocket engine fired.

End of Part I – Part II to Follow

About the Author: Dave Stern is a pen name. The author served with the 4080th Strategic Reconnaissance Wing, USAF, and various defense contractors for 18 years involving cryptographic communications within the NORAD/SPADATS Space Surveillance System. He rebuilt and flew a Brantley B-2 helicopter in the Central Alaska interior while performing maintenance on DHC Twin Otter fixed-wing aircraft and P&W PT6A-20 engines. Now retired, Dave resides in Renton, Washington and has published over 38 articles on aviation/aerospace history and other subjects.



Profile of 3,000-Mile and 5,000-Mile Ramjet Missile Mounted on Booster

Contrails From The Past

by Ed Rusinek

Mr. Rusinek and the NAA Retirees,

Thank you for sponsoring the Aeronautics Basic Research award this year and, especially, for the write-up in your bulletin. My parents were thrilled to receive the copies in the mail and have been showing them off to all their friends. It is an honor to be congratulated by the men and women who have contributed so much to this country's aviation history.

Please pass on my gratitude to all those who were involved in the award, as well as a sincere thank you to the aerospace gurus who built some of the best aircraft in history!

— 2nd Lt. Joe Boben, Butler, PA

Ed's Ans.: No, Lt. Joe! It is we who thank you for the dedication and love you have for your country! We rest a little easier knowing that you and your colleagues will be there on Watch in defense of the land we all love so much.

Dear Ed,

Thank you and everyone working with you for continuing to publish a truly outstanding Retirees Bulletin. The enclosed is for your publishing needs and toward the USAF Academy's North American Aviation Recognition Awards.

— Stanley Thimakis, Tustin, CA

Ed's Ans.: Our publishing team, one lady and four gentlemen, is in the tradition of North American Aviation-we accomplish the difficult today and the impossible tomorrow. However, your complimentary words did not fall on deaf ears! Thank you for your kind praise and a most generous check. As you read in our last issue, the NAA USAF Academy Recognition Awards have been secured for perpetuity. We are the only aerospace company so ensconced.

Dear Ed,

I was pleasantly surprised to read the article in the Summer Issue written by my friend, Col. Matt Wallace, about his experience with the F-100 Hun. We were partners in a Beech Bonanza aircraft.

In 2001, we were flying a Search and Rescue exercise for the Civil Air Patrol when we heard a call for help on the emergency frequency. A man flying a motorized hang glider was forced down in the mountains near Mesquite, Nevada. He had a broken leg and was tangled in the wreckage. We were unable to get helicopters to the scene, so we arranged to meet an ambulance on the highway and guide it to the crash site using cellular phones. The ambulance arrived at the crash scene 2-1/2 hours after we received the initial transmission. The pilot survived and attended our Wing Conference two months later with his doctor. They wanted to thank the CAP and to be there when Matt and I received our life-saving awards.

— Meryl Winans, Las Vegas, NV

Ed's Ans.: Meryl, you told me that your motto is "NAA Retirees do not retire to watch the grass grow". The Bulletin is richer for having you as a reader and Matt as a writer. God bless you both!

The following was forwarded to the bulletin by Lt. Col. Angela Suplisson from the USAF Academy.

Hello Ma'am,

I am having a wonderful relaxing break and getting excited about the University of Washington!

I would be honored to be mentioned in the next NAA Bulletin. My home town is Austin, Texas.

Once again, thank you for everything and please let Ed Rusinek and everyone else at NAA know how honored and appreciative I am to receive the award from them.

— Very respectfully, 2nd Lt. Jared Becker

Ed's Ans.: Again, we thank these splendid young men for dedicating their lives to the defense of this great country. Each of the three Second Lieutenants that received the NAA Achievement Awards have been assigned to various universities to complete an advanced degree before they enter flight training. God Bless them all!

Dear Ed,

The article by Roger Wood on the A-5 Vigilante, Spring 2011 Issue, did not mention the origins of the airplane. The NAA Columbus Division submitted an unsolicited proposal to the Navy for the NAGPAW – North American General Purpose Attack Weapon. I was part of the team that prepared this proposal, one of the relatively few unsolicited proposals ever to become a major weapons system.

My role in this was programming the IBM CPC – Card Programming Calculator – to simulate nuclear weapon delivery maneuvers which would demonstrate conclusively that the NAGPAW could do this and successfully return from the mission. This was accomplished with a three degree of freedom simulation, longitudinal and vertical displacement and pitch. We would have liked to do a six degree of freedom simulation, but the proposal preparation schedule was too tight. The CPC maximum operating speed was 400 milliseconds per instruction (more than a million times slower than present day laptops), and we could only run one simulated flight each working day. The unsolicited proposal was accepted and the NAGPAW became the Vigilante.

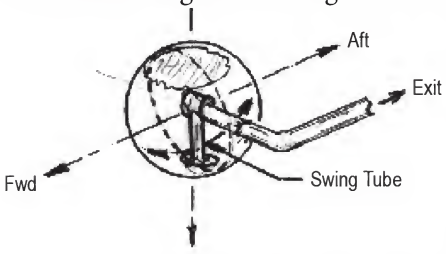
— Otto Juelich, Columbus, OH

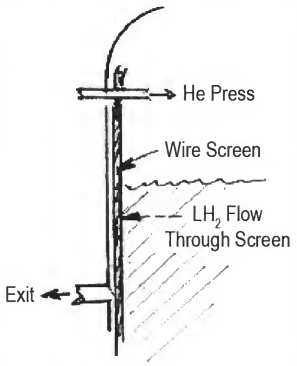
Ed's Ans.: In reflecting on my years with North American Aviation, I stand in awe at what was accomplished with slide rules, pads of vellum graph paper, 4H pencils and some very brilliant minds. Nothing was impossible and if it didn't exist, it was invented on schedule! Thank you Otto for another glance of a history making company at its best!

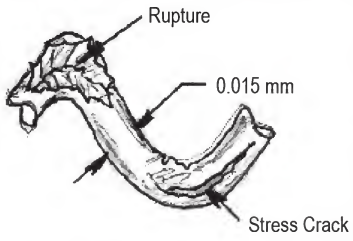
Dear Ed,

The article by Dave Stern in the Spring Issue regarding the X-15A-3 Delta Wing brought back memories. When the X-15A-2 was reconfigured to flight test a LH_2 ramjet, I looked at alternate methods of pressurization of the storage tank to determine if there might be a better way to handle all g-load conditions so that the ramjet could be safely restarted during flight—should

the need arise. In the A-2 we used a spherical tank; and it contained a g-force swing tube for propellant expulsion – similar to that used in the hydrogen peroxide tank. One of the concepts that was considered was to use a 1-micron stainless steel double-dutch filter screen, and place it against the LH_2 tank wall. Helium pressure would be applied into the tank, and the filter screen would be wetted by the LH_2 and forced through the screen and into the space between the screen and the tank wall – and into the transfer tube leading to the engine. Theoretically, this appeared to be a great concept for helium tank pressures up to 600 psi, and would be the answer for virtually any applied g-load forces—if it worked. The physical wetting force of the LH_2 with the small steel wires in the filter (0.010-0.015 mm dia) should be more than sufficient to prevent any intrusion of the helium through the filter barrier. However, I tested several samples of the screens manufactured by the leading manufacturers at that time, and found a serious flaw: during the forming of the weave, the warp weaves of the steel cords were stretched more than they could withstand. These fine 304L wires were woven about five-layers deep, and had very close contact with each strand. For filtration, that was okay; but for this purpose, they had to be structurally solid, and without any imperfections.







The filter sections examined during test failed 100% of the time. Under a 20X magnification the wires were shown to contain minute microfraction ruptures and cracks that held pockets of helium gasses—preventing LH_2 from "wetting" the screen, thus allowing helium pressurization gas to flow through the filter screen when the internal pressure reached about 30 psig. I tested various combinations for about three months and concluded that currently the manufacturing capability of the industry to produce a solid screen was not yet available. However, NASA thought otherwise and issued a large study contract to one of our competitors for evaluation. It was eventually concluded that the concept wouldn't work. The tankage system for the A-3 concept I initially supported to advance design, was without the screen system – and depended upon a positive g-force to position the LH_2 into the rear of the tankage for delivery to the ramjet. *The wire screen is still a good concept, providing that an in-line rotary pump is placed into the feed line to boost the inlet pressure to the Ramjet to its required pressure level; and the tankage pressure held to about 7-10 psig.*

— Cleve Kimmel, Billings, MT

Ed's Ans.: Wow! Thank you Cleve for presenting this problem in such simple terms that even I could grasp it!

Congratulations and Best Wishes to

Harold and Betty Hayes
of Medford, Oregon
celebrating their
67th Wedding Anniversary

Dave and Eileen Herold
of San Marcos, California
celebrating their
64th Wedding Anniversary

Charles and Kay Rogers
of Yorba Linda, California
celebrating their
57th Wedding Anniversary

Ronald and Virginia Murphy
of Temecula, California
celebrating their
50th Wedding Anniversary

May you have
Enough happiness to make you sweet,
Enough trials to make you strong,
Enough sorrow to keep you human, and
Enough hope to make you happy.

"Politicians and diapers have one thing in common. They should both be changed regularly, and for the same reason."

— Author unknown

Empty Sky

On pillars of fire, they rode to the sky
With awe and wonder, we'd watch each one fly

The contrails remained, for a while they would linger
Like paint on a canvas, left there by God's finger

Shuttles were much more than just pieces and parts
They were alive to us, with souls and hearts

We'd watch each one rise until it went out of sight
Then get back to work for the very next flight

Columbia was first, it seems long ago
135 times we've said three, two, one, GO!

When *Challenger* went, she took seven of our best
A moment in time that ripped the hearts from our chest

We got up and kept going, it's part of our spirit I'd say
And we made it through that, on to much brighter days

From satellites to Hubble and the Space Station too
Wasn't very much at all, that this team couldn't do

When *Columbia* was lost, it brought back our worst fears
She hit the earth hard, and so did our tears

Bounced back from that too, it's a harsh business we're in
Made things safer than ever, and got flying again

The Space Station is finished, and what a magnificent sight
From the mind of man, a new star lights the night

Yet it seems that the country has now lost her way
With dreams put on hold for some distant day

Cause our birds could keep flying if they just had the chance
It's like stopping the music before the end of the dance

Or maybe it's right, to have a beginning and end
With something new coming, we just don't know quite when

People like me will move aside and give way
It's time for the new ones to step up to their day

They can look at *Atlantis*, she'll stay here to retire
Won't fly anymore, but she still can inspire

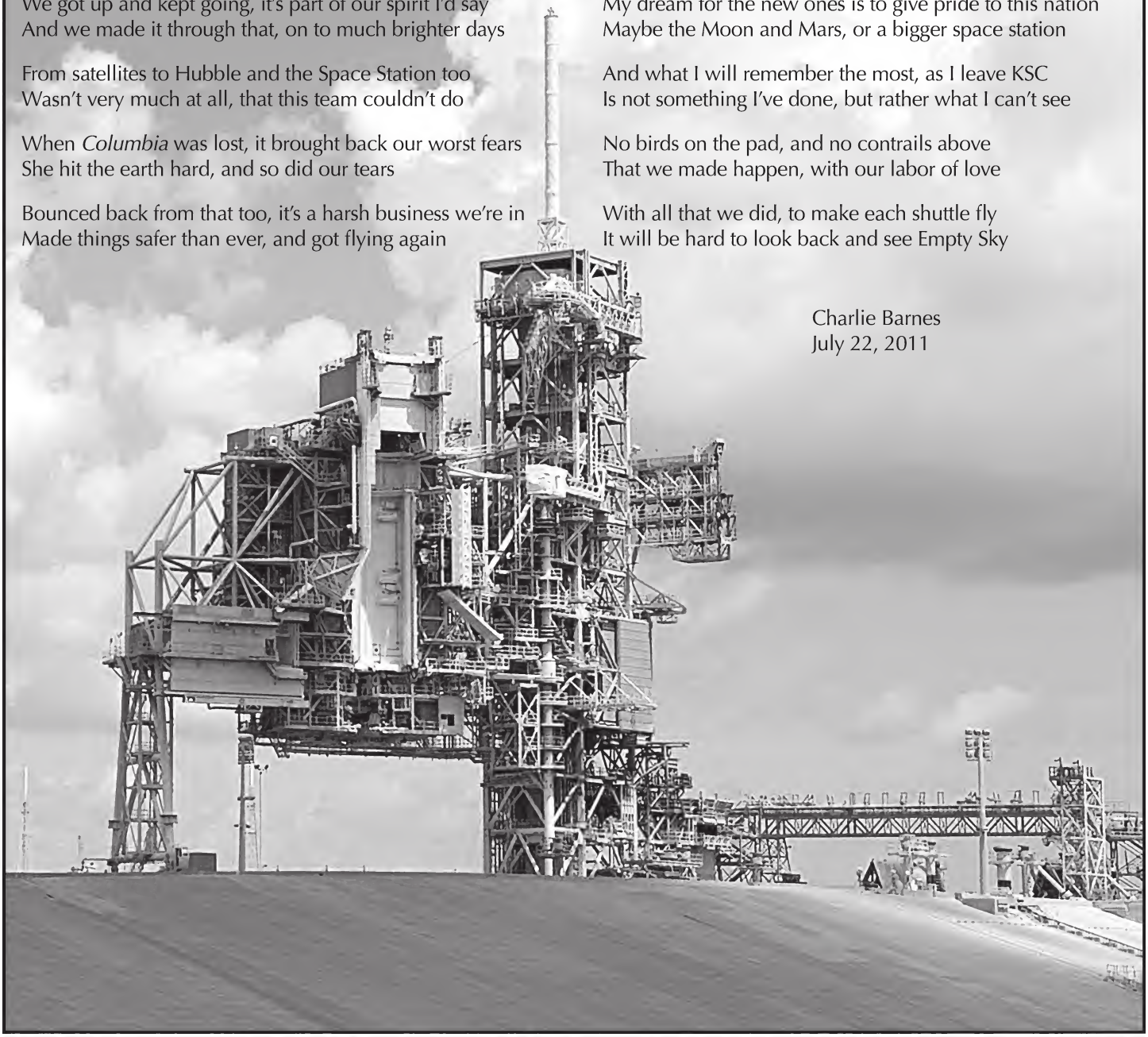
My dream for the new ones is to give pride to this nation
Maybe the Moon and Mars, or a bigger space station

And what I will remember the most, as I leave KSC
Is not something I've done, but rather what I can't see

No birds on the pad, and no contrails above
That we made happen, with our labor of love

With all that we did, to make each shuttle fly
It will be hard to look back and see Empty Sky

Charlie Barnes
July 22, 2011



The Silent Majority

by Stan Guzy

ALVAREZ, ALBERTO V., 79 – passed away in Huntington Beach, CA on May 24, 2011. He served for 35 years on various programs including the X-15, Hound dog, Apollo, and the Space Shuttle and retired in 1990. Al is survived by his wife of 59 years, Dolores.

BENNETT, EDWARD L., – Bulletin returned marked "Deceased February 9, 2011". Bulletin records indicate that Edward Bennett retired from LAD in 1978 with 40 years of service.

BENNINGFIELD, HAROLD Z. "BENNY", 85 – passed away at home in Torrance, CA on June 29, 2011. He served aboard the transport ship *USS McCrakin* during WWII. Harold served in Aerospace for almost 40 years when he retired from Rockwell.

BRONNER, EDMOND J., 84 – a Rancho Palos Verdes resident, Ed passed away on June 4, 2011. He retired from Rocketdyne as a director in Manufacturing in 1989 with 31 years of service. He is survived by his loving wife, Betsy.

CANCLINI, ALFRED L., – passed away on June 13, 2011. Al started his career with NAA in 1939 on the checkout line for B-25 and P-51 engines. He later moved to Autonetics where he spent time flight testing inertial guidance systems for submarines. In the 1960s, he was a lead engineer on the Apollo capsule checkout line in Downey. In 1972, he joined the B-1A program to test the B-1 radar systems. With 45 years of service, he retired from Autonetics working on modifications to the Minuteman guidance systems.

CHABRE, FRANK L., 78 – died June 11, 2011. He was a Claremont, CA resident. He joined NAA in 1959 and had a distinguished career as an aerospace executive with NAA, Collins Radio, and Rockwell International. He is survived by his wife, Anne.

CHRISTENSEN, ELLIOT "CHRIS", 84 – of Fullerton, CA, passed away on June 21, 2011. After serving as a radar technician on mine sweepers in the Pacific during WWII, Chris graduated from Purdue University with a BSEE in Electrical Engineering. He joined Autonetics and worked on several avionics and marine systems from radar engineer to program manager before he retired in 1989 with 27 years of service. He is survived by his wife Libby.

COLLACOTT, THOMAS L., 84 – of Westminster, CA passed away on November 9, 2010. A WWII Navy veteran, he served on every sea and every continent. Tom was Proposal/Pricing/Negotiator at Autonetics on the Minuteman, Apollo, S-II, and Space Shuttle. He also negotiated a guidance system contract with the Australian Royal Navy for their nuclear submarines. An adventurous spirit, he pursued many interests. Tom retired in1988 with 27 years of service. He is survived by his loving wife of 32 years, Karen.

DARDEN, JESSE A. "JA", 86 – the Bulletin was notified of JA's passing on August 3, 2011 in McAlester, OK. He retired from NAA/RI and was President of the Rockwell Retirees Club of McAlester, OK for many years.

DOMINGUEZ, JOSEPHINE H. "JOSIE", 83 – passed away at home surrounded by her loved ones on November 4, 2010. A woman ahead of her time she retired from NAA/RI as Manager of Data Processing after 34 years of service. She was married to Ruben, her husband of 58 years.

EMERO, DONALD H., 78 – of Fountain Valley, CA died on August 20, 2011. Don had a brilliant career at NAA/Rockwell holding several prestigious positions including Chief Engineer of the Space Shuttle Program. He was awarded the NASA Distinguished Public Service Medal and the coveted astronaut Silver Snoopy award. He retired from Space Division in 1997 with 30 years of service. He will be remembered as a man of outstanding character and as a gentleman who was deeply concerned about others. He is survived by his devoted wife, Pepita.

ENRIQUEZ, OLIVIA H., 86 – passed away in Redondo Beach, CA on June 10, 2011. Olivia joined the wartime effort and became a Rosie the Riveter at NAA in 1945. After becoming a wife and mother, she continued to work as an assembler at NAA/Rockwell for 33 years until she retired in 1985. A people person, she never slowed down and kept active in civic, church and family activities.

GEARHARDT, VIRGINIA, 70 – of Sacramento, CA died on July 7, 2011. Ginny joined Autonetics shortly after it moved to Anaheim. She was a valued administrative assistant for two decades in the 1960s and 1970s. She was known for her skills and attention to detail. She was predeceased by her husband David in 2007.

GRAHAM, JOAN KINDELBERGER, 90 – passed away in Santa Monica, CA on June 16, 2011. She was born to James K. "Dutch" and Thelma Kindelberger on October 4, 1920 in Cleveland, OH. At the time, her father was a draftsman at the Glenn L. Martin Co. working alongside another draftsman named Donald Douglas. In 1929, Dutch moved to Los Angeles to become Chief Engineer of Douglas Aircraft. In 1935, Dutch again changed jobs to become President of North American Aviation. The family's good fortune was marred in 1939 by the tragic death of her younger brother, Howard, in a horseback riding accident. Married three times, she had three children: Karin, Toni and Jim. She was tragically predeceased by her oldest daughter Karin just five weeks prior to her own passing.

GRACIE, JOHN D., 88 – passed away in West Hills, CA on November 27, 2010. John had been a commissioned Naval Aviator and joined NAA after WWII. He remained in the aircraft industry for 29 years before retiring in 1980. John was predeceased by his wife Sandra Gracie in 1996.

HARNEY, DANIEL J., 83 – died in Irvine, CA on June 6, 2011 with his loving wife by his side. With a degree in accounting and an MBA in Production Management he became Controller of the Los Angeles Aircraft Division and the Saberliner product lines. When he retired, he turned to community service as the Executive Director of the St. Vincent de Paul Society. He founded the Harvest Food Bank Program, distributing food to 480 agencies serving their community. He is survived by his wife Annemarie.

KIRBY, WILLIAM A. "BILL", 80 – of Golden, CO, died at home on July 21, 2011 after a hard battle with cancer. Growing up under meager circumstances, Bill used a milk crate as a shoe stand on a street corner in Los Angeles at the age of 8 to help his family. He received a degree from UCLA in Production Management and became a trainer at Sheppard AFB, TX for the Air Force. In 1954, he came to LAD and advanced to Chief of Quality Engineering. In 1965, he transferred to Rocketdyne Division as Quality Assurance Manager. He next moved to Launch Operations at KSC as Director of Quality and Reliability Assurance. His managerial skills led him to further assignments at the B-1 Division, North American Aircraft Operations and Rocky Flats. He retired in 1989 with 35 years of service. Bill is survived by his wife Gloria Sue.

LUCE, DONALD E., 84 – passed away in Torrance, CA on June 11, 2011. Don served at LAD in Tooling Design for 41

years when he retired in 1989. He is survived by his wife of 60 years, Betty.

MADEWELL, JAMES "JIM", 78 – of Mission Viejo, CA, died on June 16, 2011. Jim began his 50-year career in 1956 with Werner Von Braun's NASA Team at Marshall Space Flight Center. He was a key player in the development of the Apollo, Skylab, Space Shuttle, International Space Station, B-1 and B-2, and the X-33 second generation Space Shuttle. He is survived by his wife of 58 years, Arlene.

MANARINO, PETER F., 79 – died in the spring of 2011 with many of his family at his bedside in Lake Forest, CA. Pete had a distinguished career with Autonetics, LAD, and the Space Division utilizing his Logistics and Product Support expertise to the fullest. He worked on the many programs including Minuteman, B-1 and Space Shuttle over a span of nearly 35 years. I had the privilege of working with him on several of those programs. He is survived by his devoted wife of nearly 60 years, Florence (Flo).

MAY (MOKSLAVESKAS), JOSEPH J., 92 – (brother of Ed Mokslaveskas) passed away in Garden Grove, CA on June 30, 2011. Joe developed into an expert aircraft sheet metal mechanic over the years at LAD Manufacturing. He worked on many aircraft from the T-6 to the B-1 Bomber over the 41 years he spent on the line. Joe is survived by a daughter, Valerie, and two sons, Keith and Kevin. (Joe changed his name to "May" at the request of his wife.)

McCORMICK, G. PAUL, 94 – of Worthington, OH, passed away on June 15, 2011. After 13 years in LAD Manufacturing on the P-51, F-86, and F-100, Paul transferred in 1950 to the newly opened Columbus Division as Superintendent Details and Experimental. He continued to advance to Vice President Aircraft and remained in management positions until the last B-1B was delivered. Paul served as a consultant for another ten years. In 2007, he was inducted into the "Mustang Legends Hall of Fame". He was preceded in death by his loving wife of 70 years, Emma. Although we never shook hands until we met at the 2010 Bald Eagles Reunion, Paul was a good friend and contributing author to the Bulletin. He will be missed.

MILLER, RODMAN E. "ROD" – the Bulletin has been notified that Rod had passed away in May 2010 in Medford, OR. He retired from Sabreliner in 1984 with 37 years of service.

MORRIS, DONALD B. 80 – of San Clemente, CA died on August 27, 2011. After graduating from Auburn University, Don became a Navy pilot earning his wings at Pensacola. After completing his duty, he joined NAA/Rockwell and designed interiors for aircraft and spacecraft in Downey. He is survived by his son Bart and daughter Sally.

OZBIRN, JAMES A. – the Bulletin has been notified that James passed away in Yorba Linda, CA on May 14, 2011. He retired from Autonetics in 1990 with 25 years of service.

POTTER, WILLIAM W. "BILL", 86 – of Westminster, CA died on August 5, 2011. Bill joined NAA and served in Contracts and Pricing at Space Division on the Apollo and Space Shuttle programs. He retired in 1986 with 26 years of service and two Snoopy Awards in recognition of his efforts. He is survived by his loving wife of 25 years, Doris.

ROGERS, JOE, 84 – of Garden Grove, CA, died on June 21, 2011. Joe was late reporting for work at LAD on his first day, November 9, 1959 because his son, Kevin, was born that day. He was assigned to the Plastics Department forming canopies. He later transferred to the Layup Group in Downey, working on the Apollo and Shuttle Programs. Joe retired in 1991 with 32 years of service.

SANDIFORD, MARY A. "BILLIE", 81 – passed away in Onyx, CA on July 22, 2011. Billie was a steady hand at LAD in aircraft production of wiring and cabling. She advanced to lead girl at the Crenshaw Facility and retired in 1987 with 35 years of service. She is survived by her husband of 63 years, Vernon. He is also an NAA Retiree.

SNYDER, EDWIN "ED", 73 – of Lakewood, CA, passed away on June 2, 2011. After a long career as a police officer, Ed joined NAA Security at Downey and served 16 years before retiring as Supervisor. He is survived by his loving wife, Sheryl.

SPADE, CHARLES I., 79 – passed away in Rancho Cucamonga, CA on May 19, 2011. He retired in 1993 from Space Division with 45 years of service as an engineer on various programs including the Space Shuttle. He is survived by his loving wife Marcella.

SMOTHERS, WILLIAM C., 81 – passed away on May 19, 2011 in Garden Grove, CA. He worked at NAA/RI for over 29 years as an electrical engineer. He is survived by his wife of 60 years, Patsy.

WAITE, PAUL I., 86 – passed away in Viara, FL on March 19, 2011 after a valiant two-year battle with cancer. Winning a scholarship with Pan American Airways, Paul became a flight radio officer on commercial flights. During WWII, he served in the Army Air Forces, and later, advanced to MIT's Lexington Laboratory. Moving to Florida, he worked on the Northrop Snark Missile before starting a 27-year career with North American Aviation. He served in management positions on the Minuteman Program at the Canaveral Air Force Station for 8 years. In 1968, he became base manager at Vandenberg Air Force Base. He served in key roles there and at MIT's Draper Lab on the development and flight testing of the (MX) Peacekeeper Weapon System guidance systems. He retired from Autonetics in 1987 and is survived by his loving wife of 63 years, Dorothy Jean.

WOOLHOUSE, DWIGHT L., 65 – of Placentia, CA succumbed on July 16, 2011 after an extended battle with brain cancer. Dwight began his career with McDonnell Douglas on the Skylab program after graduating from San Diego State University. Joining RI in the early stages of the Shuttle program, he served in Orbiter Design, Product Assurance, Vehicle Operations and, eventually, became Program Manager for Orbiter Development at the Boeing Huntington Beach facility. He was known for his deep dedication to human spaceflight, engineering excellence and customer responsiveness. He is survived by his loving wife of 40 years Carolyn.

LOST SHEEP, BULLETIN RETURNED WITH NO FORWARDING ADDRESS

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LARRY P. SIMPSON – VAIL, AZ

GEORGE STAYBOLDT – SPRING VALLEY, CA

JOHN M. YOSAN – LA PALMA, CA

NORTH AMERICAN AVIATION
RETIREES BULLETIN
P.O. Box 3797
Seal Beach, CA 90740

North American Aviation Retirees Bulletin
"Where The Best Never Rest"

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NASA Photo

Ribbons of steam and smoke trail space shuttle* Atlantis *as it nears touchdown on the Shuttle Landing Facility's Runway 15 at the NASA Kennedy Space Center in Florida for the final time on July 21, 2011. Securing the space shuttle fleet's place in history,* Atlantis *marked the 26th nighttime landing of the NASA Space Shuttle Program and the 78th landing at Kennedy. On board were STS-135 Commander Chris Ferguson, Pilot Doug Hurley, and Mission Specialists Sandra Magnus and Rex Walheim.

NORTH AMERICAN AVIATION
Retirees Bulletin

"Where The Best Never Rest"

Winter 2011

Inside:

THE SPACE SHUTTLE CHALLENGE AND LEGACY: AN ENGINEER'S VIEW by Larry Korb

THE NORTH AMERICAN AVIATION MX-770 PROJECT – PART II by Dave Stern

COMING HOME ON A HUN AND A PRAYER by Matthew Wallace



Painting by Anthony Saunders courtesy of the Military Gallery

On September 11, 1944, P-51D Mustangs of the 20th Fighter Group, flying out of RAF Kings Cliffe, England, engage Me 109s in a furiously contested dogfight. Below them, a formation of B-17s from the 379th Bomb Group fly through the chaos, doggedly maintaining their formation as they head on to attack the huge synthetic oil refinery at Meresburg in southern Germany. So vital was the refinery to the Nazi war machine that it became one of the most heavily defended targets in Germany, surpassing even those of Berlin. The action is captured in the painting "The Clash of Eagles" by British aviation artist Anthony Saunders.

NORTH AMERICAN AVIATION
Retirees Bulletin

North American Aviation Retirees Bulletin, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAA Retirees Bulletin can be contacted at The Boeing Company, Seal Beach facility by phone at (562) 797-3836. Send mail to:

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P. O. Box 3797
Seal Beach, CA 90740

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Dear NAA Retirees Bulletin Subscriber

As this year draws to a close; we again unfurl our colors, sharpen our wits and charge ahead in defense of the North American Aviation Way! In the July 18/25, 2011 issue of Aviation Week; an opinion article by former NASA Administrator Michael Griffin described the Space Shuttle as operationally fragile, logistically undependable and always one misstep away from tragedy and ready for the scrap heap of history. This begs the question, *"Who the hell is Michael Griffin?"* What great aircraft or spaceship design teams has he led? What stunning design concepts has he conceived that will impact future designs? Oh yes! He served as a NASA associate administrator and has done some research and authored several technical papers during his years in academia that were probably highly praised by his colleagues during lunch at the faculty club. He has also chaired several technical societies and has been recognized with the obligatory medals and awards. Ah, but now it seems remorse has set in and Michael Griffin now says, *"But I see no sense in retiring the Shuttle in favor of nothing. That is beyond foolish."* Well Duh! It took him three months to realize that there is no replacement vehicle available to replace the Shuttle. In this issue, we have our champion, Larry Korb, responding to this seemingly confused former NASA Administrator with our rebuttal to his claptrap!

For the third Winter Issue in a row, we again have a fantastic painting of the North American Aviation P-51 in action. This time, it is The Clash of Eagles by the renowned British Aviation Artist Anthony Saunders. We contacted his representative, The Military Gallery, and discovered that they have a USA office in Ojai, California. The manager, Mr. Rick Taylor, was most gracious and cooperative in granting permission and providing a suitable copy for the print on our cover. If you are ever in the neighborhood in Ojai, do stop in and enjoy the many works by Anthony Saunders. He is a very talented artist as is evidenced by his many splendid aviation and naval paintings!

Once again, Colonel Matt Wallace joins us with a thrilling account of action in Vietnam with his F-100D Hun, although badly damaged, bringing him home back to base. In reading his account of this mission, I think you will recognize the heart-pumping factor when you are having a real bad day which ends on a good note! A fighter-bomber, the F-100 saw action in Vietnam from the early 1960s through 1970. It could carry up to 7,040 pounds of bombs and was armed with four GAR-8 Sidewinder missiles, two GAM-38 Bulldog missiles, rockets and four M39 20 mm cannons. Indeed, the North American Aviation Super Sabre F-100 was one very rugged airplane flown by very rugged pilots.

Our history sleuth, Dave Stern, provides us with the second half of the story of the first North American Aviation space project, the MX-770 Missile. When I joined the Aerophysics Laboratories in Downey in February 1951, I wasn't aware of all that had transpired at NAA since the end of World War II which led up to the Navaho X-10. Dave's account fills in many of the missing pieces of the puzzle.

It's Official! The 50TH GOLDEN ANNIVERSARY BALD EAGLES REUNION will be held on Saturday, April 28, 2012 at the Proud Bird Restaurant. The speaker will be James Albaugh, Executive Vice President of the Boeing Company and President and Chief Executive, Commercial Airplanes. He will speak about the Boeing 787 "Dreamliner" and provide a Boeing overview. Since this may be the final gathering for many of us, why not get a group together and make this a real Golden Anniversary celebration!

Finally, it is the end of the year and for some of you it is time to renew your subscription. If the date above your name and address is DECEMBER 2011, this is your final issue. We realize that it is easy to put this bulletin down and forget about the renewal until you receive a reminder card from our Sonnie Robertson. However, at this time there will be no reminder card! Sonnie is undergoing some rare, painful and very serious issues with her eyes which threaten her vision. Thanks to the very efficient system Sonnie maintained, Stan and I will be able to accommodate all the new and renewal subscriptions. However, our greatest concern right now is over our team member and good friend, Sonnie! We are praying for her recovery and we ask all of our readers to please join us and remember her in your prayers.

In renewing your subscription, you do not have to cut out the coupon on this page. Merely, send us your check with your name and your current address and we will do the rest!

In this season of spiritual celebration of all faiths, may we close on a happier note by wishing all of you that you be loved, that your health be hale, that your hearts be happy, that your future be prosperous and that your spirits be bright! God bless you all!

The Space Shuttle Challenge and Legacy: an Engineer's Viewpoint

by Larry Korb

Editor's Note: Former NASA Administrator Michael Griffin wrote a very derogatory opinion piece about the Space Shuttle in the July 18/25, 2011 issue of Aviation Week & Space Technology. He provided no evidence to justify his rant. Our strong Shuttle advocate, Larry Korb, chose to respond. Here is his answer to Mr. Griffin and his unjustified and unsubstantiated laments!

Introduction and History

When the Apollo Program wound down, NASA was scrambling to find a role for manned space. Nixon stopped the moon visits with Apollo 17. Having lost the race to the moon, the Russians moved to the Space Station concept. The Space Station concept was first described in a book by Edward Everett Hale called *"Brick Moon"*, written just after the Civil War. The famous Russian self-taught physicist Konstantin Tsiolkovsky in 1895-1903, the famous German physicist Herman Ober in 1923, and Wernher von Braun in the mid-1950s provided detailed design concepts for rotating Space Stations (which would have artificial gravity). Von Braun, describing his concepts, emphasized his Space Station could also function as an Earth observation post and a jumping off place for a lunar trip. In the 1950s, Wernher von Braun wrote a series of space articles for Colliers Weekly Magazine. Walt Disney, impressed by these articles, and with von Braun's help, produced three documentaries which were shown on ABC TV. The first show was broadcast on March 9, 1955.

In 1969, the year we landed on the moon, NASA proposed a 100-person permanent Space Station to be completed by 1975. It provided a laboratory for scientific and industrial experiments, as well as a base for lunar launches and supplies. As NASA's budget dwindled, they saw that the use of rockets to build and resupply the Space Station would be far too costly.

Meanwhile, to use the extra rockets and spacecraft left over from the Apollo Program, NASA conceived of an Apollo-Soyuz mission and also used an empty S-IVB stage, called Skylab (Apollo Applications Program), as a Space Station. The Skylab was lofted to a 275-mile orbit on May 14, 1973. It was nearly a disaster due to the loss of a micrometeoroid shield, which also acted as a sun shade. The micrometeoroid shield ripped off one wing of solar cells and jammed the other. With power cut by more than one half and an internal temperature of 190°F, it was necessary to reorient the Skylab from the ground away from the sun to bring the temperature down to 110°F, while keeping the jammed solar array fixed on the sun. The first crew was able to add a sun shield and unjam the solar array, making the Skylab habitable. Thus, three teams of astronauts were able to spend 29 days, 59 days, and 84 days in orbit, respectively, in a "shirt-sleeve environment".

NASA and contractor studies of a Space Station, in 1968, pointed out that the key to its success required a vehicle such as the Shuttle to transport Space Station parts for assembly in space and for regular supplies of cargo to the Station (and to provide for its trash removal). The Shuttle contract went out for bid in 1972 and was won by the Rockwell Space Division in July 1972.

The Russians had launched their first of five Salyut Space Stations in 1971, followed by four more launches: one in 1973, two in 1974, and one in 1976. None of the first three lasted over 2 months, before falling out of orbit. In 1977 and 1982, the Russians launched their second generation Space Stations, Salyut 6, and Salyut 7 and in 1986, launched the *Mir*, a third generation Space Station. It took 16 years after NASA flew the first Shuttle Orbiter before the first module of our Space Station could be delivered. The only way NASA could get sufficient funds for the Space Station was to get a two billion dollar budget increase, to transfer funds from the Space Shuttle Program, and to establish an international consortium to help build it and to share costs. The first International Space Station module was launched in 1997. By that time, the *Mir* was well into decline. The 15-year old *Mir* Space Station was deorbited in March 2001.

The Birth of the Shuttle

As those of us in the space field know, it is the politicians that set the direction for future space programs and hardware, with NASA presenting the studies and arguments. Spiro Agnew, Vice President to Richard Nixon, chaired the National Aeronautics and Space Council. In 1969, they considered four options to follow the Apollo Program:

1. A Manned Mission to Mars
2. A Follow-on Lunar Program
3. A Low Earth-Orbital Infrastructure Program (Space Station and Shuttle)
4. Discontinue Manned Activities

Wisely, in my opinion, they chose the Low Earth-Orbital Infrastructure Program and in 1972, President Nixon gave the go-ahead. The problem, immediately recognized, was that the budget would not allow both the Space Shuttle and Space Station programs to be developed simultaneously and NASA recognized that the Space Shuttle should go first, so it could be used to support the Space Station launch, assembly, and provisioning at a future date.

The Apollo Program invoked a rash of criticisms, such as, *"Why are we wasting all of that money on the moon?"* (Actually, we paid the wages to skilled American workers in the United States.) The major benefits from a Space Program are that it develops cutting-edge technologies which keep our country in the scientific and technological forefront, increasing exports and commerce. Some argue, *"Isn't it better to develop cutting-edge technologies by a civilian agency, rather than the Military?"* In either case, the technological benefits are often opaque to the public.

Engineers are quick to recognize these gains for other applications, such as the tiny camcorder that filmed the landing and walking on the moon, the miniature electronic devices needed in computers and spacecraft, the capture of a satellite in space, the miniature medical devices to track the health of astronauts, the advances in numerous fields: aeronautics, guidance and navigation, materials, communications, etc. To let the public know the space program would be directed toward them, many of us gave briefings on the Space Shuttle Program with a cover page that said, *"Space Shuttle: For Down to Earth Benefits."*

While awaiting the construction of the International Space Station, of course, NASA had to come up with plans for Space Shuttle missions that would be rewarding and capture the public interest.

The Space Transportation System

In his book, Space Shuttle, The History of the Space Transportation System, Dennis R. Jenkins, devoted the first 191 pages to reviewing the Space Shuttle System design options and studies. After exhaustive configurational studies, cost analyses, etc., the optimized Space Transportation System was to consist of four major modules: the Space Shuttle Orbiter, two Solid Rocket Boosters (SRBs), an External Tank (ET) containing cryogenic liquid hydrogen and liquid oxygen and three Main Engines (SSMEs) burning the cryogenic propellants. The solid rocket boosters were to be recovered at sea, refurbished, and be reused for 20 flights. The Main Engines were reusable for 55 flights, and were attached to the rear of the Orbiter to insure they were recovered. The Shuttle Orbiter was to be reusable for 100 flights. The External Tank landed in the Indian Ocean and economical recovery would have been virtually impossible. We were trying to impress on the public that we were oriented for maximum part reuse, which would result in cost savings, unlike the Apollo Program where every part was either rarely or never reused.

All of these major modules posed tremendous technical challenges in their designs and manufacturing, but only the Orbiter will be discussed in detail.

The Technical Challenges of the Shuttle Orbiter

I had worked on the Apollo Program and thought it was the most advanced and challenging engineering program that could ever be. Yet, I soon realized that the Space Shuttle Orbiter was every bit as challenging and complex. There were challenges in every engineering field. Six typical examples are as follows. It must be recognized that these are only very superficial overviews of very complex technologies.

Flight Verification Testing – First of all, the Orbiter was a large vehicle, 120 feet long, with a tail 55 feet high, and having no air-breathing propulsion, would have to fly the entire return mission, first as a reentry vehicle at Mach ~25, next as a hypersonic vehicle, then as a supersonic vehicle, and finally as a subsonic airplane and land as the world's heaviest glider. The X-15, the fastest rocket plane ever designed up to that time, had flown at a record Mach 6.7. The X-15 was a research vehicle and made 199 test flights.

Even more disturbing and making it more challenging, the Orbiter was to start out as an operational vehicle, virtually without a test flight. Oh, yes, we did 5 approach and landing tests on the Orbiter, releasing it from atop a Boeing 747. The longest was from 26,000 feet for a 5-1/2 minute flight, but there was no way to check out the Orbiter throughout the major portion of its flight, including ascent and reentry.

The Boeing Company had extensive experience with aircraft loads, aerodynamics, avionics, equipment, etc., with commercial aircraft, yet the Boeing 787 Dreamliner was tested for 1,707 flights for a total of 4,828.5 hours. Our first Shuttle flight would carry astronauts, a very gutsy and risky procedure, indeed. In other words, we had to do it perfectly without any practice orbital test flights. The Russian *Buran*, a near carbon copy of the Space Shuttle Orbiter, however, was launched without astronauts. Their avionics guided it through the whole flight regime, including the landing in its only flight.

Cargo Capability – The Orbiter was designed to carry 65,000 pounds in a cargo bay 15 feet in diameter and 60 feet long. You could easily have put an18-wheeler inside it. From the cargo bay we could launch five satellites during a mission. Cargo bay doors had to be very stiff to seal under both thermal and pressure loads and be able to accommodate the shrinkage, expansion, and the distortion of the spacecraft due to differential temperatures and different thermal expansion characteristics of the carbon-epoxy cargo bay doors and the aluminum spacecraft. For example, if the bottom side of the Orbiter reaches -160°F and the top side reaches +200°F, the vehicle will grow 3.2 inches on the top side and shrink 4.2 inches on the bottom side and takes the shape of a banana. The cargo bay doors must accommodate this and seal and latch perfectly. Before reenty, the vehicle must be rotated in the sun to equalize temperatures on the top and bottom.

Not only must cargo be safely stowed, released, retrieved, and deployed by the remote maneuvering system arm, but, in many cases, a satellite must also be spun up for stabilization. Each satellite had a different size and shape and areas, which were sensitive to damage, so extreme care was needed.

Heat Shield – While the Apollo saw higher temperatures during reentry than the Space Shuttle, the Apollo heat shield did not have to be reusable. The Shuttle heat shield had to maintain its aerodynamic shape without erosion for 100 flights to insure the boundary layer was not tripped early, resulting in turbulent flow and overheating. Ablatives could simply not be used. Further, the ablative used on the Apollo would have weighed 4 times that of the tiles finally used. A metal heat shield could also not be used, for testing had shown such a shield is subjected to severe repeated thermal stresses and results in warping and failure. Further, in the temperature range of the Shuttle underside, only coated refractory metals could survive the heat. They are too heavy and inspections to find detrimental oxidation, occurring during missions, would be impossible.

Therefore, NASA and Lockheed invented an amazing new heat shield concept-ceramic tiles. The tiles were made from pure (99.62%) silica fibers. (If less pure, the material would change from amorphous silica to crystalline crystobolite upon cooling and crack the tiles at the ~450°F isotherm.) To make the fibers, a molten pure silica material was extruded under pressure, forming fibers that were 1/40th the diameter of a human hair. These were then cut to 1/8-inch lengths and put into water, making a slurry. The slurry was drained to form a cake, and the cake was fired at ~2,500°F to allow the glassy fibers to bond together. A typical tile was six inches square, though many odd shapes and sizes had to be used.

Silicon has an unusual characteristic, a practically zero coefficient of thermal expansion; therefore, it could withstand the thermal shock of plunging a 2,500°F hot tile into liquid oxygen (-320°F) without failure. The final tiles could survive repeated heating to 2,400°F, yet weighed only nine pounds per cubic foot ($1/7^{th}$ the density of water). To protect the tiles from rain on the pad and to give them the ability to radiate over 80% of their heat to outer space (emissivity) on reentry, a

thin glass coating of black borosilicate glass was applied. The borosilicate glass contained silicon tetraboride for increased emissivity, and when, over time, this is oxidized, it formed the same borosilicate glass as the coating itself.

Because the tiles are 93% void and can absorb water up to seven times their weight, they must be waterproofed to resist a possible downpour while on the pad. The heat of reentry burns out the waterproofing down to the 1,050°F isotherm. Therefore, they must be re-waterproofed before each flight.

The major problem with the tiles was that they have such low strength, typically an average of 24 psi and a design allowable of 13 psi. Because the orbiter vehicle is made from aluminum, the temperatures cause major dimensional changes in the aluminum, as previously discussed. The tiles must be mounted such that the mounting pad (called the strain isolation pad or SIP) absorbs the deflection due to temperature, loads, vehicle contour mismatch, pressure, and acoustic loading. The installation of tiles must achieve tight aerodynamic limits on gaps and steps, as low as $1/25^{th}$ of an inch (combined value) in key forward areas to avoid premature tripping of the boundary layer. Key areas may require even tighter tolerances.

The secret to a heat shield is to keep the plasma on the outside of the vehicle and to delay transition to turbulent flow until well past the maximum thermal pulse. (Plasma consists of electrons and the ionized molecules of air broken down by the heat of reentry.) The tiles have very high emissivity for getting rid of heat during entry and exceptionally low conductivity to slow the remaining 20% of the heat which flows through the tiles to the aluminum structure, which, itself, must be kept below 350°F. If the plasma dives to the aluminum surface, it will easily melt the aluminum. Filler bars of Nomex nylon are bonded to the skins under the tile edges to prevent heat and plasma between tiles from scorching the aluminum, whereas, ceramic gap fillers are used to minimize the gaps and steps between tiles.

Coated ceramic (quartz) fabric and fibrous quartz battens are used in blankets protecting upper surfaces, which may reach 1,200°F. While a full discussion of the heat shield is beyond the scope of this paper, the system requires a specification of 930 pages to accommodate critical requirements and procedures for tile installation.

One problem faced late in the program was that the SIP caused premature failure of the tiles, typically causing them to fail at 45% of their average ultimate strength. The SIP pad, made from Nomex nylon felt (a non-burning nylon) is needled to give it strength in the thickness dimension, accomplished by pulling barbed needles through the thickness, essentially sewing it together. These needled locations act as stress concentrations causing premature failure of tiles. A method of densifying the tile inner mold line solved this problem, by increasing the tile strength at the bond line of the SIP to the tile. The tile bonding strength was important for the low strength tile had to withstand the world's largest controlled explosion (launch) without debonding.

Even the silicone rubber (room temperature vulcanizing or RTV) used to bond the tiles will not cure properly unless moisture is present and each RTV batch must be tested and have a time marked on its container to tell the technician when the adhesive is still good.

The nose and wing leading-edge members saw temperatures of up to ~3,200°F and required development of a special carbon-carbon material. These leading edges have about 9,000 psi strength and must be protected from damage and oxidation during entry. The shapes are laid up as epoxy rayon composites, then graphitized above 3,000°F. The pores are repeated filled with furfural alcohol (at least four times), and each time they are returned to the graphitization treatment. Then, the densified carbon-carbon shapes are treated at above 3,000°F with silica to form a strong hard, oxidation resistant silicon-carbide surface. When they cool down, coating cracks form in the coating due to the differences in coefficients of expansion of the carbon-carbon and the silicon carbide coating. These must be patched with tetraethyl orthosilicate and heated to allow formation of silicon dioxide in the cracks. Lastly, a final coating of a low melting point glass that will become fluid during reentry is applied and it flows and seals the coating cracks during the entry phase.

Could the heat shield be tested before flight? Testing is severely limited. The largest size that a suitable plasma arc facility can test is less than two feet square, and is not even big enough to check out door seal designs, for example.

Avionics – The avionics used on the Shuttle Orbiters are several orders of magnitude more complex than on the Apollo, designed just 10 years earlier. The Orbiter was the first aircraft to use a highly sophisticated fly-by-wire system design. In such a system, no mechanical energy from the pilot was required to set and change the aerodynamic controls. It was decided that a computer system would be required to control the vehicle through all phases of flight, for the final Orbiter vehicle was inherently unstable, incapable of even rudimentary controls without the help of an onboard computer system. To insure absolute reliability, four identical computers (AP-101Bs) would function as a quadruple-redundant set during mission phases such as ascent and reentry. They processed the same information supplied by two separate data busses (2 computers on each bus) in precise synchronization. If a conflict arises, the computer majority rules and the crew is alerted that an errant computer exists. The primary software system contained 500,000 lines of code and it was estimated it would take 10,000 years to test every branch of the original code. This obviously was not possible, so the concept of "error free" software did not exist.

A fifth computer, the Backup Flight System was originally used for system management and non-avionics functions. To protect against possible program errors existing in the primary avionics system, it was decided that an independent backup flight system would be available for use. This system would have its own set of requirements and not reuse any of the code being developed for the other computers. The backup flight software was written by Rockwell International.

An analysis of the IBM-developed primary (PASS) software, after the *Challenger* accident, showed that it had a defect rate of 0.11 errors per 1,000 lines of code. The code, written by IBM, took several years to program and cost five hundred million dollars.

The complexity of the Orbiter operation is best illustrated by the 2020 displays and controls in the flight deck.

Space Shuttle Main Engines (SSME) – The Rocketdyne Division of North American Rockwell won the SSME con-

tract. Virtually all other rocket engines used to put men or satellites into orbit now lie at the bottom of the ocean. This is not true with the SSMEs, for they were designed to be reusable up to 55 flights. This was a major technological breakthrough which took 10 years to develop the technology. Some 27 engine failures were experienced before all problems were solved. These engines burn at 6 000°F (above the melting point of all but three elements) in a 2,900 psi nozzle environment, yet the nozzles are so designed that they would be cool enough to touch during firing. During the 55-mission lifetime (27,000 seconds), the engine will burn 30 million pounds of hydrogen and oxygen, using 970 pounds of oxygen and 162 pounds of hydrogen per second. The rocket engine can be throttled up to 109% and down to 65% of thrust to suit the mission profile. It can be gimbaled up to 10 degrees. The pipes and plumbing lines must withstand 8,000 psi. The three engines generate 23 times the power of the Hoover Dam or 37 million horsepower. Each engine has a computer to process data from more than 200 sensors to monitor and control its operation some 50 times per second. It is the only heavy-lift engine that performs continuously from liftoff to orbit. Its thrust is 380,000 pounds (in air) and >500,000 pounds (in a vacuum), at least several times that of the largest jet engine. The hydrogen turbopump spins 567 times per second, and each of its 2-inch blades generates 700 hp. The high pressure propellant turbo pump delivers more horsepower than 28 locomotives! The engine weighs 7,780 pounds and is 13.9 feet tall and has a nozzle exit diameter of 7.8 feet. It has been continuously improved during its lifetime. For example, some 38 major changes were made after the *Challenger* accident.

Other Systems – I emphasize that in all technical disciplines there were major cutting-edge developments. For example, to analyze a tile for failure, under various sets of loads experienced during the flight, initially took anywhere from 12 hours to two weeks per tile by hand analysis, depending on tile location, the tile shape, and the environmental complexity. With over 27,000 tiles on the vehicle, this was a nightmare. Furthermore, loads had a way of changing quite often. The Stress Group developed an advanced computer program that would allow it to analyze each tile under those same circumstances in approximately 2 minutes. The methodology, so unique, was presented at an International Conference in the Netherlands in 1988.

In every discipline, there were major challenges and solutions to make the Orbiter safe in its operations.

What Did the Shuttle Orbiter Accomplish?

John Shannon, Space Shuttle Program Manager outlined in Aviation Week & Space Technology (July 18/25, 2011) some of the major accomplishments of the Space Shuttle Program, and dispelled a few cost myths that are in the news. Let us look at these accomplishments. The Shuttle launched 135 flights flown by 852 astronauts and put 3.5 million pounds of payloads into orbit.

The Shuttle missions generally fell into one of eight categories. One category was to launch large astronomical telescopes. The Hubble Space Telescope was launched in 1990. It was a monstrous satellite, some 43.5 feet long, 14 feet in diameter and weighed 24,300 pounds. It was put into a 355-mile orbit and immediately encountered a problem. The problem was that the mirror was ground on Earth under normal gravity, and in space it changed shape (under zero gravity) and was out of focus. A fix was devised for its optics and installed in 1993 during a Shuttle mission. The design life of the telescope was three years, at which time batteries or gyroscopes would most likely fail. It was captured and repaired four more times in 1997, 1999, 2002 and 2008. It is estimated to be useful beyond 2012. So the telescope was fixed and has already accorded 18 years of excellent service, providing a wealth of astronomical data. To support astronomy, the Space Shuttle also launched the Compton Gamma Ray Telescope and the Chandra X-ray Observatory, allowing for observation of the universe covering several electromagnetic bands of wavelengths. The Compton Gamma Ray telescope, weighing 37,000 pounds, actually consisted of four main telescopes and covered the gamma ray and X-ray spectra. The Chandra X-ray Observatory weighed over 50,000 pounds including its propulsion module, and was put into an elliptical orbit, reaching 1/3 of the way to the moon, at its farthest point. It was just under 60 feet in length.

Another Shuttle mission category was to launch large planetary probes. The Shuttle Orbiter launched the Galileo Spacecraft to Jupiter, the Magellan Spacecraft to Venus and the Ulysses Spacecraft to study the Sun. The Galileo spacecraft weighed only 5,650 pounds and was 23 feet high. The Magellan Spacecraft used synthetic aperture radar to map the surface of Venus. The Ulysses spacecraft was tilted at an 80-degree angle to the Earth's plane of orbit, allowing for observation of the poles of the Sun from an orbit that covered the distance of one to five times the distance from the Earth to the Sun.

A third category was to develop Earth sciences. The Shuttle launched the Upper Atmosphere Research Satellite that has mapped the entire Earth's surface with synthetic aperture radar. The Orbiter has also monitored pollution from space on numerous occasions.

A fourth category was for zero-gravity experiments on the Spacelab missions to develop protocols for their use on the International Space Station. The Spacelab design was for a module in which a wide range of scientific studies could be made in space in the cargo bay area. It consisted of one or two cylindrical pressurized modules, 13.5 feet in diameter, 9 feet long and extended up to 23 feet, including the airlocks. The Spacelab was built under the direction of the European Space Agency and NASA. Some 23 different Spacelab missions were conducted.

A fifth category was to provide cargo to the Space Station. Some of these were accomplished in Spacehab missions. A Spacehab is an integrated cargo carrier mounted in the cargo bay. There were 22 Spacehab missions.

A sixth category was to launch commercial, NASA, and Air Force satellites. One major NASA satellite was the Long Duration Exposure Facility (LDEF) to test the long-term effects of radiation on materials and coatings used in space. Several commercial and Air Force satellites were also launched, but these were discontinued after the Challenger accident. In one mission, 3 commercial satellites were launched.

A seventh category was to rendezvous and dock to the Russian *Mir* Space Station. On nine different occasions, crews docking with *Mir* were able to enter the *Mir*.

The final, and the most important, reason for the Space Shuttle was the building of the International Space Station (ISS), connecting American, Russian, Japanese, Canadian, and European Space Agency modules. It has also provided extensive provisions for the International Space Station. Some 37 Space Station missions were required.

The accomplishments of the Space Shuttle were many.

Criticisms of the Space Shuttle Orbiter

Within NASA, there are two schools of Engineers: those who have a bias toward robotic and unmanned missions and those with a bias toward manned missions. Until the cancellation of the manned spacecraft programs, they shared roughly equal amounts of the NASA budget used for space missions. Both groups have had their successes, their disasters, and their cost overruns.

Personally, I have a bias toward manned programs, for my philosophy is that the purpose of life is to relate to your environment and fellow humans. I was for the manned lunar landing, because people could identify with the astronauts and feel the thrill of their walking on the moon. I saw only mild interest, at best, in the previous landing of the lunar surveyor vehicle. I recognize that space telescopes, like the Hubble, the Chandra X-ray Observatory, and the Compton Gamma Ray Telescope are desirable and can only be unmanned. I also recognize the importance of planetary probes, including the robotic explorers on Mars, yet hope in the back of my mind, that man can visit the surface of Mars. I recognize both are needed for a balanced space program. In recent days, the manned space effort has been turned off. Frankly, taking the astronauts out of the Space Program, I think will diminish America's interest in NASA and space.

It is the people on TV who act and sing and perform that excite us. We love to watch people competing against each other. We love to watch the speed, endurance, and coordination of those who are running, diving, swimming, or playing soccer, football, and basketball. We also get excited when men, using their tools or machines, are competing, such as car racing, motor cycling, or pilot stunt diving maneuvers in airplanes. We enjoy a skier engaged in the slalom or ski jumping, the X-games, or those who use tools to hit a ball, as in golf, tennis, baseball, or even those who use pitons and special gear to climb mountains.

Can you imagine watching robots competing in basketball or baseball or computer driven cars racing each other? I can't. Recall how useful the astronauts were when they saved the Hubble telescope with five different repair missions or repaired solar cell panels that were jammed on the Space Station or Skylab, performing in such a way that no robot could. In short, we do need astronauts for the country to be willing to continue to put money into space activities.

In the July 18/25, 2011 issue of Aviation Week & Space Technology, the former NASA Administrator, Michael Griffin, criticized the Shuttle as being *"Operationally Fragile"*. Michael Griffin is from the school that opposes manned participation in favor of unmanned or robotic spacecraft. In addition he points out *"the gap between promise and performance (of the Shuttle), the significant amount of money spent on it, what it can and cannot do, and its stunning successes and tragic failure."* He muses, *"So as we design in the future, what we can learn from having built and flown the Shuttle, loved and feared it, exploited and been frustrated by it."* After some left-handed compliments, he states, *"The Shuttle is fragile and logistically undependable. Its demonstrated reliability is orders of magnitude worse than once predicted and certainly no better than the expendable launch vehicles it was meant to replace. It does not degrade gracefully (whatever that means. I don't remember seeing that requirement in the procurement specification). It can be flown safely only with the greatest possible attention to detail."* Griffin does decry the tremendous effect of extreme budget constraints. Throughout his message is some praise, Motherhood, and condemnation. His vision for the future *"is to go beyond low Earth orbit and the Shuttle can't take us there."* (Did he forget why we designed it?)

Mr. Griffin is so totally misinformed in so many ways, that I must respond to these somewhat mythical allegations. First, I will attack the technical criticisms; then, those related to schedules and the costs.

Space Shuttle Accidents

In 135 flights of the Space Shuttle Orbiter, two vehicles have been destroyed and cost the lives of 14 Astronauts. Let's examine these accidents and their true causes which are often wrongly attributed to the fact that the Shuttle is "Operationally Fragile". Did it ever occur to Michael Griffin that the Space Shuttle Orbiter performed as expected, but we lost two of them due to poor program management decisions, in that the engineering decisions of assigned experts in their field were overruled by the NASA Program Managers? The Shuttle was not "operationally fragile", the Management was!

The *Challenger* Accident – The media was enthralled with the fact that an ordinary schoolteacher, Sharon Christa McAuliffe was going to fly in the *Challenger* on the 25th Shuttle Mission (51-L). The press literally made life very difficult for the NASA program management. They wanted the story but the flight was subjected to four flight delays over a 5-day period. (None of these had to do with temperature.) On the final launch date, January 28th, however, it was an unusually cold morning. The major concern was with the Thiokol seals on the Solid Rocket Cases. Thiokol stated that they lacked data that their seals on the solid rocket cases could be expected to work properly below 53°F, for they would not be resilient enough to seal-instead they would be hard and inflexible, allowing a flame to escape the joint. In fact, they were absolutely right and some 73 seconds into flight the hydrogen tank was ignited by a flame which blew past the seals and a massive explosion occurred, destroying the *Challenger* and killing all seven astronauts on board.

There was a history for this condition: erosion of O-rings had been seen on 12 of the previous 24 flights and actual blowby had occurred on nine flights. The Thiokol engineering experts recommended against launching it with seals below 53°F.

But why did NASA launch? A Launch Director at Marshall Space Flight Center said, *"If I have to wait for the seals to get to 53°F, I can't launch until April,"* clearly, an exaggeration! Rather than taking the advice of knowledgeable engineers, Marshall Spacecraft Center appealed to a higher power: the Chief Engineer at Thiokol at their headquarters.

Why did they escalate the problem? Well, simply because "they got away with it the last time" and "it was kind of a Russian roulette". Clearly, there were implications that Thiokol hardware was unable to support flight schedules during the cold winter months. At the time of the explosion, approximately 200,000 pounds of hydrogen was still in the External Tank.

The fallout of this disaster was extremely damaging. It caused a 32-month delay in Shuttle launches as in-depth analyses were made to uncover any other hardware weaknesses in the Space Shuttle System and to redesign the seal joints. The long wait could not be tolerated by the Air Force who would never again launch a payload from the Orbiter. President Reagan issued an executive order prohibiting commercial satellites launches in future Shuttles. The cost associated with the disaster was 12 billion dollars, according to a 1992 White House Advisory Committee.

One could ask, *"Was the joint design the real problem?"* The joint was surely marginal and poorly designed, and I agree with the findings that it could not perform at the launch temperature that day. But, the design and seals were a known weakness and demanded that corrective action be taken; i.e., let them warm up to be functional. Had Program Management honored the engineer's advice and awaited their warm-up, the accident would not have happened. Was the Orbiter "operationally fragile", as Michael Griffin implies? Absolutely not! We could never design an Orbiter to withstand such a gigantic hydrogen tank explosion!

I chalk this loss up to a management failure. If you exceed the limits put on hardware by the engineers who know and designed the hardware, you are asking for trouble! The fragility truly lies in program management.

(Note: After redesign of the seal joints following the *Challenger* accident, temperatures as low as 44°F could be tolerated during launch.)

The *Columbia* Accident – Upon reentry from the 113th Shuttle Orbiter mission, *Columbia* tore apart and burned up, killing seven astronauts. Films, taken of the launch, examined the day after the launch clearly showed two chunks of foam broke off from the External Tank and impacted the Shuttle Orbiter late in the launch phase. In these films, it was not possible to see the extent of the damage which may have occurred. A Debris Assessment Team was formed in Houston of NASA and Boeing engineers to evaluate the danger to the Spacecraft from the impact. This team was inexperienced, but nevertheless recommended that NASA ask the Air Force to examine the *Columbia* damage with their powerful land-based cameras (which can read the numbers on the tiles on an orbiting Shuttle). The 1,200 Shuttle experts at Seal Beach, who had been on the program for 30 years, had just been taken off the program before this mission and NASA wanted the engineers in Houston to step up to the plate and take care of operational problems by themselves. The Houston engineers were forbidden even to call the experts at Seal Beach for advice.

Movie film analyzed the day after the launch showed one foam piece weighing about 1.6 pounds hit the Orbiter left wing at about 780 feet per second. This calculates to about 15,000 foot-pounds of energy. While the Shuttle Orbiter has been struck by foam and ice before, it was usually on the pad or during early launch. Up to that time, over 16,000 hits had been recorded (mostly on tiles) on the Orbiter without affecting flight safety. The tiles, though easily damaged, are remarkably damage tolerant. This time, however, was different. The impact energy was at least 400X that of the previous experience base. No one had knowledge of the precise location on the left wing where the impact had occurred.

The NASA Program Manager and Chief Engineer at Houston remained adamant. There would be no Air Force pictures taken of the Shuttle in orbit to ascertain the extent of damage. Whether this was to avoid negative publicity by the Press, which may cause a mild panic, or to put the astronauts at ease, I don't know. The Chief Engineer said that if it were a disabling hit, there wasn't much they could do about it anyway! Wrong!!!

The Shuttle *Atlantis* was available in the Vehicle Assembly Building and its launch could have been expedited to rescue the astronauts. While it had never been tried, certainly enough space walks and EVAs had been done to show it would be relatively simple to perform such a rescue. With a picture taken of the damage, a repair plan could then have been devised in Houston to save the Orbiter by filling the damaged leading-edge panel with ablative or some other substance. *Columbia* could have been left in orbit until such a repair had been developed. After a rendezvous to make the repair, the Orbiter could have been flown without any astronauts aboard to land safely in Florida, though this may have required a few tweaks in the existing software to cover the commands after landing. This could have been another of NASA's finest hours, ranking right up there with the Apollo 13 mission.

In the writer's opinion, at least five things went wrong. First, Marshall was warned that debris from the External Tank could cause the loss of an Orbiter. They also knew that hand-sprayed foam occasionally would fail to knit to the cured foam underneath, yet they did not resolve the problem. It could have been solved by foaming through a protective scrim cloth, which was later shown at Rockwell to increase the foam composite strength by 100 times.

Second, the program officials at Houston were too adamant against taking pictures, although the impact energy was clearly orders of magnitude beyond their experience base. Thirdly, the green team members of the Debris Assessment Team should have put their careers on the line, demanding pictures, as well as consulting impact experts at Seal Beach. Their job was still to assess the effect on vehicle safety. Without pictures, this was impossible. Fourth, the Chief Engineer at Houston did not assume responsibility for the safety of the crew by getting pictures, by considering an EVA rescue and by considering a way to save the *Columbia* Spacecraft. This was unforgiveable, and perhaps, criminal negligence. Fifth, it pointed out a flaw in the NASA basic safety program. Although NASA planned for an abort rescue during launch (4 different abort scenarios), they never considered what they should do to save the crew and an orbiter with a damaged heat shield that couldn't survive reentry.

The leading edge on Panel #8 had been breached with a hole estimated to be about 10-12 inches in diameter. The carbon-carbon on the leading edge is quite strong, capable of withstanding 9,000 psi. The impact energy of the foam,

however, was so large that it deflected the panel and it broke from exceeding its strain capability. To picture a 15,000 ft-lb impact, consider 1,500 pounds dropping on a piece of a plate glass window, suspended on two edges, from a height of 10 feet. Such an impact could not be expected to be tolerated by the vehicle. The breech allowed 3,200°F plasma to enter the wing, erode through the carbon-carbon side walls of the leading edge panels, melt the Inconel fasteners (>2,500°F) and melt the aluminum wing structure (~1,100°F). No, Mr. Griffin, the vehicle is not "operationally fragile". The wing leading-edge was robust, but simply overpowered by the magnitude of the impact. The impact energy was at least 10,000 times that permitted by specification for the Shuttle. Marshall had failed to control their processes for the adherence of hand-sprayed foam. Nevertheless, in spite of this, Houston Program Management could have prevented the disaster. Once a threat exists, Program Management must do its job to prevent catastrophic consequences.

In both of the above cases, a Management failure, which overruled knowledgeable engineers, caused the loss of the 14 astronauts and two vehicles.

In summary, to attach a stigma to the Shuttle, itself, where Management fails to recognize and address problems, is to assign the blame wrongly. The Accident Investigation Boards love to fault "the NASA Culture" and note that NASA is severely underfunded and tries to do too much with too little. Hey, we know that! They are reluctant to actually blame the Management individuals at fault and assign fault to a faceless NASA.

After the *Challenger* accident, the Shuttle had one failure in 110 flights. One might rationalize that it was an excellent record for a research vehicle. I do not. There were 87 consecutive successes before the *Columbia* accident. Success is an opiate. Management, riding such a wave of successes becomes confident, overconfident and then, arrogant; resulting in diminished caution and increased carelessness. Any safety threat must be properly evaluated and corrective action must be taken, wherever possible.

As an engineer, I am proud of the legacy of the Space Shuttle and marvel at how pristine it would look if key management had also done their jobs as well as we did. To say the Space Shuttle is "operationally fragile" is to wrongly assign the blame. The Space Shuttle survived 133 flights and would have survived the other two, had Program Management listened to the engineers.

Costs

It is very true that the Shuttle did not make the expected costs and turnaround as planned. What is not written in the newspaper is that the actual cost of launching a Space Shuttle is $400,000,000 per flight per John Shannon, the Space Shuttle Program Manager in his article in the July 18/25, 2011 issue of Aviation Week & Space Technology. The costs you see quoted at ~1.5+ billion dollars per flight are those which include the cost of facilities and infrastructure of the NASA. This makes good press if you are against the manned space program, but is not really fair. It is like saying the cost per mile on your car must also take into account your clothes, your garage, the car washings, the food you eat to be able to drive the car, etc. Ridiculous! If the Orbiter carried a 50,000-pound payload to lower Earth orbit, it would cost 8,000 dollars per pound. In the past, 10,000 dollars per pound was considered reasonable.

The cost of the Delta IV, to put 50,000 pounds into low Earth is now 170 million dollars. This is obviously less, but our costs are certainly not unreasonable, recognizing that we have astronauts on board and the Delta IV does not. We cannot afford to take risks to the astronauts and our consequences of failure are many times those of the Delta IV. (Remember, the *Challenger* accident cost NASA 12 billion dollars.) Further, our paperwork and labor, all under high government scrutiny, make costs much higher than in a commercial venture.

One should further remember that costs go up every year and to compare costs per flight envisioned in 1972 to costs in 2010 is not realistic. For example, the Saturn V cost of 6.6 billion dollars in 1964 is equivalent to 44 billion dollars in today's dollars. Our costs were modest and within reasonable expectations. To condemn these costs is to admit a NASA error in estimating (to rationalize the program), not an overrun in the program.

NASA estimates were based on a faulty cost model. But above all, the NASA was incredibly naïve. Initial requirements for the Shuttle program were to launch over 400 missions in 11 years (Press Information, The Space Shuttle Transportation System, 1982), whereas we actually launched 135 missions in 30 years. When the *Challenger* failed, NASA lost all Air Force launches and all civilian satellite launches (by President Reagan's decree). Hey, 400 missions in 11 years would surely keep the average cost per flight down. After the *Challenger* Accident, NASA, itself, was its only customer. In other words, the NASA cost model was absolutely specious.

Turnaround Times

Desired turnaround times were also naïve estimates. Our best turnaround time achieved was about two months. The vehicle needed to be safed (by removing hypergolics and explosive devices) and reconfigured from its "down mission" to its "up mission". It must be thoroughly checked out and equipment showing anomalies must be tested and repaired or replaced, Payloads have to be installed and checked out. Some tiles require repairs or replacement. The launch configuration must be restacked, refueled, and the integrated vehicle checked out on the pad before launch. We even have to accept weather delays.

To insure the reliability of every rework action taken on the vehicle requires about 10 hours of paperwork for every hour of technician hands-on work. The crews at the Cape are technically competent, highly dedicated, and quite dependable. They work long hours and no one in the world can safely turn around the vehicle faster than they do. Any mistakes in turnaround can cause the Congress to shut you down. But you cannot fault the Shuttle design for the typical 60 to 120 day turnaround. You must fault the naïve and highly optimistic NASA estimates. A two-week turnaround or a one-month turnaround is simply not possible.

Problems that take place in commercial aviation do not achieve nearly the scrutiny that NASA faces. Can you imagine shutting down all American Airlines flights for

32 months because of an aircraft accident? I personally feel today's costs are the best we can do under continuous government scrutiny.

Note that in NASA's original model of 400 missions in 11 years, with four Shuttles, there would be nine launches each per year or it would require a turnaround of 40 days. They never could have achieved that.

Is the Cost Worth It?

The cost of manned space was initially three billion dollars per year in the 1970s and early 1980s, but rose to ~five billion dollars in the years since then. That allotment had to provide for the design and operation of the Space Shuttle and the design and operation of the Space Station, and the replacement of one Orbiter. It also provided for studies and activities for extending the life of the Orbiters from 10 years to 30 years.

But it did more than that! Many think the Shuttle Orbiter was 1970 technology and is now obsolete. Nothing could be farther from the truth. More than 11,000 major design changes (MCRs) were added to each Shuttle Orbiter vehicle, incorporating design changes and modifications to make it safer, speed up turnaround, lower costs, and to add the latest technologies. It was not a static program, but very dynamic and kept all Orbiters up to date. To imagine how comprehensive this effort was, think of a major change being described on a single page of a 500-page book. It would take 22 volumes to cover these changes (and that is just for the Shuttle Orbiter). Thousand of changes were also made to the ETs, the SSMEs and the SRBs.

Is 5 billion dollars per year to maintain the manned space program too costly? To put it in perspective, it is 1/700 of the Federal yearly budget and 1/3,000th of the gross national product. It is so small as to be minuscule. That is 0.14 cents of every dollar spent in this year's budget.

To put these costs into perspective, Wal-Mart sells 8 billion dollars per week (60% more in a week than our yearly manned-space budget). For example, Americans spend 143 times as much for furniture and 125 times as much for new cars each year.

Is keeping a manned space capability worth it? In my view, yes! Absolutely! Since the Shuttle Program was started in 1972, we spent 9 trillion dollars for welfare or 45 times as much. Was welfare worth it? I could easily find 100 government programs I think that are not worth it. The manned space program is not one of them. In my opinion it was the Government's finest, non-military program and was always respected for its accomplishments.

Shutting Down Manned Flight and the Shuttle Program

The Orbiters design requirements were to be operational for 100 missions or ten years of service, whichever came first. The Shuttle Orbiters were actually designed for 400 flights each. We used a "safe-life" concept with a factor of four, thus insuring they are completely safe for 100 flights. When the 10 years was up, NASA insisted we qualify them for 30 years of service. We did that by regularly replacing plastic parts and elastomers that degrade over time. The average Shuttle has ~32 flights and can easily go for 100 missions (Missions Flown: *Endeavour*, 25; *Atlantis*, 33; *Discovery*, 39).

To shut the program down at this time is tantamount to having three cars with 32,000 miles on each and scrapping them, leaving you with no method of even going to the grocery store or doctor. For what reason? Simply politics!

The Russian Progress 44 spacecraft failure on August 24, 2011 points out how foolish this decision may be. What if the Russian Progress booster is out of service for an extended period of time?

We must never forget, the Mercury and Gemini Programs were simply political, with a goal of trying to catch up with the Russians. The race to the moon was to beat the Russians. Pure politics! The cancellation of the Shuttle Program makes no engineering sense, but politics never does. As the saying goes, "You live by the sword, you die by the sword." Manned space started with politics and now has been slain by politics.

What we want to know is that now that five billion dollars per year would no longer be spent for manned space, did the NASA budget get reduced?

Summary

I, like my colleagues and NASA peers, consider it a distinct privilege to have worked on the Space Shuttle Orbiter. It was exciting and satisfying and we built "one hell of a vehicle". Technically, the Orbiter performance was outstanding, exceeding our expectations. Michael Griffin decries that hundreds of details must be carried out for its successful function. But face it, Michael; this is the state-of-the-art of a highly sophisticated research space vehicle, not a truck to haul dirt! You claim, *"The Shuttle was intended to be robust, reliable, and ready to fly dozens of times per year, and with a higher level of dependability than any expendable vehicle could ever hope to achieve."* That is just NASA hype.

Michael, show me where it says that in the Shuttle procurement specification. The statement *"the Shuttle was intended to be..."* is all fluff. We build to technical requirements, not to someone's dreams or propaganda. As for launching a vehicle a dozen times per year, that was NASA's flawed model of turnaround, based only on desire, not experience. As for the higher level of dependability, that was compromised by NASA Management.

Our engineering never let us down, though our creation, the Shuttle Orbiter, on two occasions, was the victim of poor NASA management decisions. This was a truly magnificent machine. No other reusable spacecraft exists. The government can take away our manned space programs, but they can never take away our legacy. It is a rich and rewarding one.

Acknowledgements

The author is indebted to Jim Rowe, Doris Whang, Frank DeBarro, John Tribe, Ralph Gatto, Pat Hanifin, and Chuck Lowry for their excellent technical reviews, constructive criticism, and helpful suggestions.

Editor's Note: To simply thank Larry for this splendid analysis would almost belittle his outstanding effort. Larry, you make us all proud to be Americans and to be North American Aviation retirees.

The North American Aviation MX-770 Project – Part II

by Dave Stern

In 1948, the USAF requested the MX-770 North American Aviation team to extend the MX-770's range to 3,000 miles carrying an unspecified chemical, biological or radiological (nuclear device) weapon. The project team responded with a number of variations including a piloted reusable airbreather powered canard mothership carrying one piggyback, single ducted ramjet powered canard style missile with a spiked nose inlet. Two ramjet missile sizes were offered-the 680 inch long, 25,000 lb Pentaborane burning cruise missile and the heavier 1,250-inch long, 30,000 lb liquid hydrogen burning version. The rocket booster required to thrust the ramjet engine to ignition speed was redesigned to ignite in the horizontal position while in flight.

The USAF Research & Development Board also requested that NAA perform a study launching MX-770 missiles from a B-36 mothership, thus extending the range from 4,375 miles plus an additional 1,500 miles with the B-36s refueling in-flight. NAA Historical Report AL-879, dated August 9, 1949, declared that three ramjet powered XSSM-A-2 flight test articles were under construction, but nothing further was mentioned about their completion or actual flight tests. In the late 1940s, the USAF finally settled on a 5,000 mile range for the MX-770 carrying one heavy nuclear warhead. To satisfy this change, the NAA team departed from the basic MX-770 canard twin-ramjet cruise missile, proposing instead a 15,000 lb, Mach 8, delta wing 5,000 mile cruise-rocket (glide rocket), spine-mounted atop a canard planform rocket, boosted by four liquid fuel rocket engines.

It presented numerous unsolved problems requiring additional funds and a lengthy development period. At the time, all available and accumulated aeronautical research data was contained in a classified NACA four volume set with controlled copies loaned directly to the top engineering executives of major aeronautical firms. It is possible that the volumes may not have contained the quite brief low-end hypersonic wind tunnel model research forays accumulated at the German Peenemunde rocket test center.

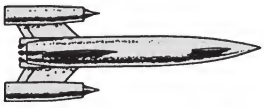
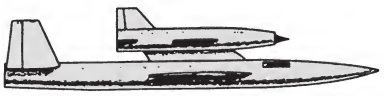
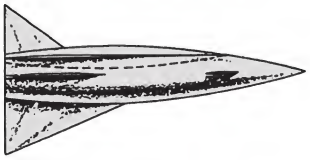
In 1945, the MX-770 guidance system was birthed in the special dust-free five-man NAA Aerophysics Laboratory that incrementally expanded to 1,636 personnel by 1951. The team initiated development of a self-guiding stellar supervised autonavigator connected to a star-tracker telescope sensing unit which provided input into the gyro-stabilized platform, thus guiding the strategic missile on its intercontinental flight to the target.

An early prototype stellar supervised inertial autonavigator system was installed and tested aboard a Boeing YC-97 transport aircraft used to perform test flights from Los Angeles to Albuquerque, NM, while a bailed USAF North American F-86D (FU-474) was used to test components of the X-10 and XB-64 autopilot. Two other bailed USAF aircraft: a Lockheed QF-80 (FT-488), modified by Sperry Corporation, tested radar-beacon, radio command systems, telemetry equipment, radio altimeter and flare computer equipment to develop reliable instrumentation for the upcoming X-10 test missiles and a USAF Lockheed T-33A (FT-879) was used to test components for the cruise missile guidance system. The three jet aircraft flew out of Edwards AFB, where there was plenty of room to set up ground support and telemetry equipment for their missions.

In 1950, NAA engineers made a unique and important advancement by pairing two separate gyros together, identified as NAVAN, with the two gyros rotating in opposite directions, which in turn, influenced the three axis of the missile's space reference system. A prototype of the complete N6 autonavigator system was completed in late 1950. By March 1951, the XN-1 inertial system completed 28 flights, and in March 1952, the NX-2 stellar supervised system accomplished a daytime flight test.

In 1948, the NAA Propulsion Group engineers assigned to create the MX-770 booster rocket engines, studied captured German engines and system components. They determined that the basic V-2 engine could be pushed beyond its originally designed performance. A regenerative cooling system, higher internal pressures, and reengineered ejector plates with only

North American Missiles

	Mach No.	Range (Miles)	Payload (lb)	Weight Empty	Gross Weight
NATIV 	2.3	60	50 (Instruments)	570	1,250
XSSM-A-2 	2.8	1,025	3,000	12,000	45,000
3,000 Mile 	2.8	3,000	5,000	10,000 (Missile) 60,000 (Booster)	50,000 (Missile) 170,000 (Booster)
5,000 Mile 	8.0	5,000	5,000	15,000 (Missile) 44,000 (Booster)	37,000 (Missile) 253,000 (Booster)

eight multiple orifice mixed-fuel injection nozzles giving four fuel-oxidizer mixing zones within the engine resulted in a newer and more powerful engine.

Converting the translated German A4 (V-2) plans from metric to American standards resulted in the construction of an unspecified number of A4 style test engines generating 55,000 to 60,000 lb of thrust when tested. Ongoing development included designing a tubular combustion chamber, thus reducing the original A4 engine weight by 50 percent. Engineers, after studying the Me-163 Komet and V-2 turbopumps, redesigned them with a higher reliability factor.

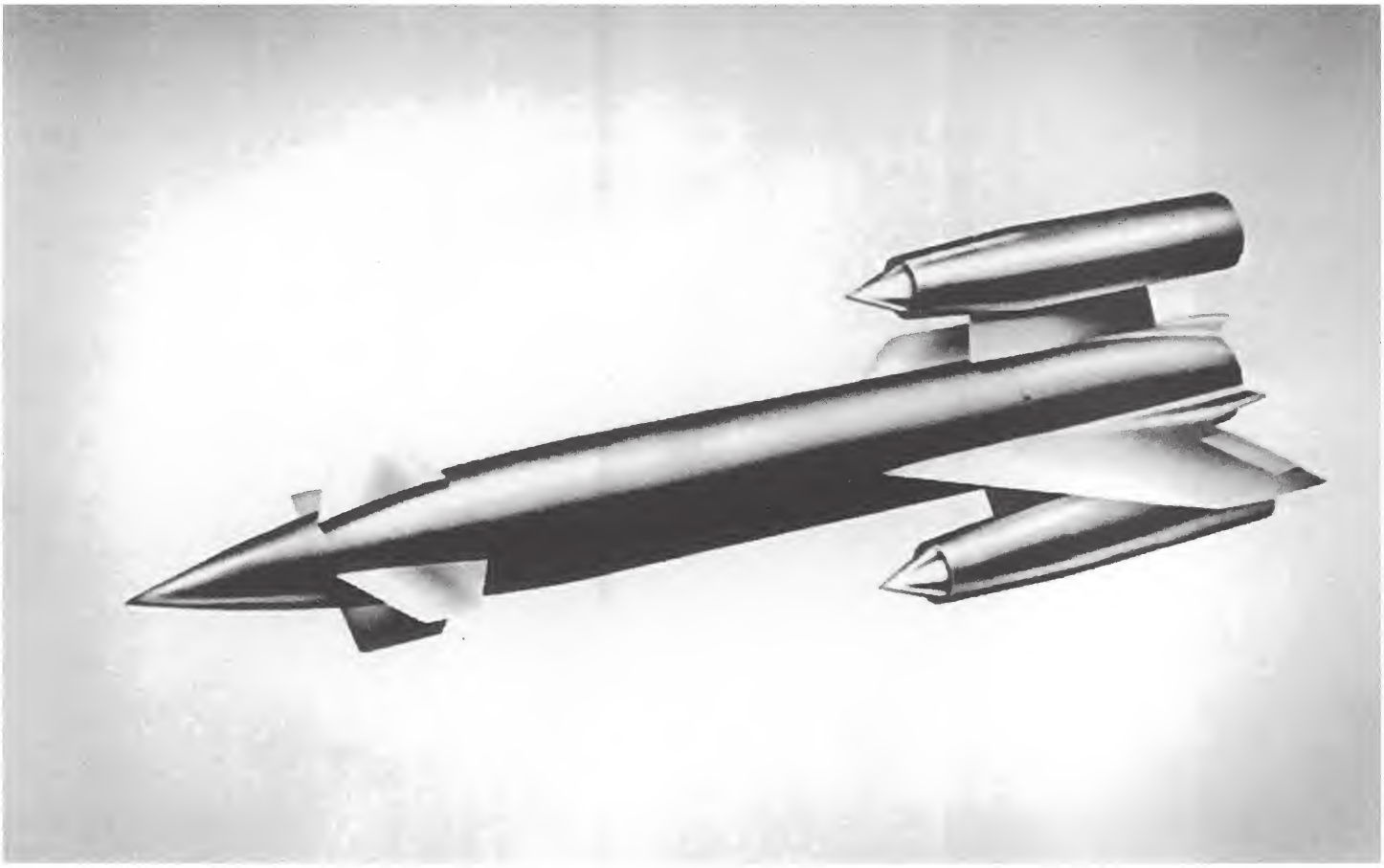
Aluminum was specified for the critical fuel injector system, including more reliable valves and piping, thus increasing overall thrust to approximately 75,000 lb. By 1950, further improvements and trimming resulted in tests generating 75,750 lb thrust while an optimum test generated 80,900 lb thrust. The USAF then designated the NAA 75-110 rocket engine as the XLR43-N-1 system (also referenced as 75K). With further thrust increases, the engine was assigned to power the Chrysler Corporation built U.S. Army Redstone missile.

In July 1950, the USAF authorized NAA to proceed with the Navaho program as Weapon System 104A (WS-104A), designed to carry a 7,000 lb special warhead (nuclear) with a 5,500 nautical miles range at Mach 2.8 or a greater speed. In 1950, the project team's work gelled into a two part WS-104A weapon system consisting of the NAA designed and built G-26 rocket powered parallel booster with the side-mounted XB-64 60° swept delta wing canard cruise missile.

The XB-64 (later B-64) cruise missiles were powered by two Wright Aeronautical XRJ47-W-5 Series 48-inch ramjet engines, each generating approximately 11,000 lb thrust. The test cruise missile were initially identified as the RTV series of test vehicles-the RTV-A5 controlled test articles designated as the X-10, were powered by two afterburning Westinghouse XJ40-WE-1 turbojet engines with hydraulic clamshell tailpipe nozzles. The design for the turbojet powered X-10 was completed in 1951. A stellar supervised inertial autonavigator and autopilot guided the B-64 cruise missile to its distant target. Original WS-104A specifications describe the B-64 cruise missile ramjets as consuming MIL-F-5616 Aircraft Fuel Grade JP-1 kerosene.

The G-26 booster burned MIL-A-6091 Alcohol of 92.5% concentration by weight, and at least 98% pure liquid oxygen. The continuing history of the WSD-104A (XSM-64), the G-28, the advanced G-36 rocket booster plus and XSM-64A Navaho history is described in James Gibson's book *The Navaho Missile Project.* Major participants at the Aerophysics Laboratory were listed as J.L. Atwood (President), L.I. Waite (Assistant to Atwood), W. Bollay (Technical Director), L.A Gore (Chief, Airframe and Propulsion Section), F.A. Ford (Assistant Chief, Preliminary Analysis Section), and J.R. Moore (Leader, Electromechanical Guidance Group), plus numerous other team members.

Editor's Note: This concludes the chapter on how North American Aviation, a premier airplane builder, became the most ingenious and creative company in the aerospace industry leading the way into Space with the Apollo and Space Shuttle Programs. We are indebted to Author Dave Stern for his undaunted research of old records at the National Archives.



North American Aviation XSSM-A-2 "Navaho"

Coming Home on a Hun and a Prayer

by Colonel Matthew B. Wallace, USAF (Ret.)

I was stationed at Phan Rang Air Base in the Republic of Vietnam from April 1967 until April 1968 flying the F-100D "HUN". This was during a period of intensive combat for allied troops; including the TET Offensive, the battle of Khe Sanh and many other brutal engagements. We were very busy fighter pilots, flying almost daily. Our most coveted missions were the 5 Minute Alerts. Under these conditions we would invariably be scrambled to assist "Troops in Contact" (TIC). That would always get our adrenalin pumping because we wanted to protect our troops from harm.

One day I was on alert with Captain Rusty Turner. Our call sign was "Devil 11" flight. About midday we were scrambled for TIC about 160 miles away in the southern IV Corps zone. When we arrived over the target area, the Forward Air Controller (FAC) informed us that we were in for an intense firefight. A large Viet Cong (VC) force was attacking a Vietnamese Special Forces Camp which was supported by a small team of U.S. Army Green Berets.

The FAC fired a white phosphorus rocket to mark the target and cleared us in "HOT". We each made three passes dropping napalm bombs where the FAC directed us. I could see small caliber tracers arc through the sky like high velocity fireflies. I called out the position of the ground fire and the FAC asked me to try to take it out on my last pass. I acknowledged and rolled in on the target, dropped my bomb, added full power and jinked the airplane to avoid ground fire.

The FAC called out and said, *"Devil 11, you look like Niagara Falls!"* I looked into the rear view mirror and saw an enormous cloud of fuel vapor. Then I checked my fuel gauges and I could visually see them dropping. I pointed the airplane northeast to the nearest friendly base. It was the Vietnamese Air Force (VNAF) base of Binh Thuy. Just then I felt a loss of thrust and saw the RPM rolling back to 70%. I flipped on the "Airstart" and "Emergency Fuel" switches. My heart was beating like a hummingbird and my butt cheeks were trying to chew foam out of my seat cushion.

"Please God, help me get this thing on the ground!" was the only thought in my mind. The RPM started to rise and we were back in business.

Rusty aborted his last bomb pass and came up beside me. He said, *"Binh Thuy is 045 degrees, 20 miles, Runway 06, 7,800 feet, barriers at both ends, frequency 321 point 5."* That was all the information I needed and it saved me a bunch of chart flipping. I wanted to stay out of clouds so Rusty could spot for me if I had to eject.

I climbed to the base of a 5,000-foot overcast, lowered the tail hook, and began visually searching for the air base in the afternoon haze. Rusty came in close to do a battle damage assessment. He said there was too much fuel leaking from the speed brake area to get a good look. I looked over my shoulder and could see a vapor stream behind me that looked like the contrail of an airliner at high altitude. If you think I was trying to analyze what was happening within the airplane fuel system with battle damage while over hostile territory; you would be wrong! I just wanted to get this thing on the ground.

The F-100 had a glide ratio of about 4:1. That means at 1 mile altitude (which is where I was) I could glide about 4 nautical miles, after the engine quit. I felt the engine could quit at any moment, so I was most anxious to get within 4 miles of the airfield. I had never practiced this type of an approach before and I am not aware anyone else had, either.

I picked up the runway at about 6 miles and the tower cleared me to land. At about 4 miles, I retarded the throttle to about 80%. When the airspeed bled below 250K, I lowered the landing gear and pointed the nose at the end of the runway. My fuel gauges indicated I only had a few hundred pounds. I never looked at them again. About a mile out, at 200K, I lowered full flaps and established a 180K approach speed.

My goal was to make an approach end barrier engagement, but it didn't look like this was going to work out. (Did I mention I don't think anybody ever tried this before?) Above the overrun I retarded the throttle to idle and extended the speed



National Museum of the U.S. Air Force photo

An F-100D of the 352nd Tactical Fighter Squadron drops a napalm bomb near Bien Hoa, South Vietnam.

brakes. Rusty had been chasing me down Final. He called and said he was "On the go" and that I had just dumped another load of fuel vapor. I landed fast, long and with a slight tail wind with about 5,000 feet of runway remaining and 4,000 feet before the departure end barrier. I deployed the drag chute and could feel the deceleration.

The F-100 had anti-skid brakes and they worked as advertised. The brakes would grip, then release before blowing a tire; then grip, release; grip, release; etc. Every fiber in my body urged me to pump the brakes, but that would have only negated the anti-skid effect and increased the roll out. (This was before cars had anti-lock brakes.)

The air base had a wide and deep canal at the departure end of the runway. I knew I would end up there if I did not snag the departure end barrier. That was not an acceptable option so I decided I would wait until the departure end barrier approached the nose of the airplane. I would then sit erect, count to "One" and eject. The F-100 had a "zero-zero" ejection system. That means you could eject at zero altitude and zero airspeed. I could, theoretically, land on the airfield, while the airplane proceeded to the canal. I thought that offered better odds than staying with the airplane.

I saw the barrier cable coming up fast toward my nose. I attempted to sit erect but was thrown forward in my shoulder harness. The nose gear strut compressed. The nose of the airplane dipped down and then snapped back to level. I felt like the heavy guy on the end of a descending see-saw. All of the amber and red warning lights on the annunciator panels were lit. Was I on FIRE? I opened the canopy and then it dawned on me. The engine wasn't running. All I could hear was the "Clink, Tink, Clink" of the compressor blades as they cooled down and came to a stop. All the warning lights were telling me was that the engine had stopped-from fuel starvation!

The emergency rescue crew helped me climb down from the aircraft. I went under the airplane to look for battle damage. The speed brake was extended. There was a small hole in the speed brake into which I could insert my gloved finger. The bullet must have "mushroomed" or tumbled because there was a larger hole in the top of the speed brake well into which I could put two gloved fingers. Above that was the punctured fuselage tank, but not a drop of fuel was dripping to the ramp. There wasn't a teacup of fuel left in the old girl; but with my prayer being answered, my trusty HUN brought me safely back to the ground.

The next day I caught a ride in a T-39 Sabreliner back to my home base of Phan Rang. I was met by Rusty, the Wing Chief of Safety and the NAA Tech Representative. Because the aircraft was forced down by enemy ground fire, I was asked to write an Incident Report. We all got together along with the Air Force fuel cell technicians to try and reconstruct the previous day's events.

The F-100 fuel system was designed with a series of fuel tanks that all feed sequentially through the fuselage tank to keep the CG in balance. They can gravity feed in case of electrical failure, but each set of tanks has a fuel pump to keep a positive pressure on the fuel system of about 5 psi. When the bullet pierced the fuselage tank, there was enough pressure to expel a great enough quantity of fuel (about 100 gal) to account for what the FAC called "Niagara Falls". Rusty said it reminded him of a fire suppression air tanker dropping a load of water.



Photo from the Matt Wallace Collection

Then Major Matthew B. Wallace is congratulated by Lt. Col. Tommy Knowles, 614th Tactical Fighter Squadron Commander, upon completion of his 300th and final F-100D Mission, Phan Rang Air Base – April 1968.

The NAA Tech Rep and the fuel cell experts said that probably caused a momentary negative pressure in the fuselage tank and the engine gulped a slug of air instead of fuel. That would account for the engine roll back. Selecting "Airstart" relit the fire in the engine. When I dropped my speed brakes on short final that caused a low pressure in the speed brake well that sucked the remaining fuel out of the airplane and was the reason for the last big spray of fuel vapor. Somewhere after touch down and just before engaging the barrier the engine gave up the ghost and quit.

About a month later I was called into the Wing Commander's office and presented with the Pacific Air Force Commander's "Order of the Able Aeronaut" safety award *"For an outstanding feat of Airmanship during an inflight emergency".*

A Final Note: My wingman and doting "Angel", Rusty Turner, separated from the USAF after the Vietnam conflict. He eventually became a Continental Airlines Captain. Rusty died in 1997. Good Night, Old Friend!

About the Author: Colonel Wallace received an AFROTC commission in 1955. Since his first operational assignment at George AFB, he has commanded two fighter squadrons and, stateside, served in Arizona, California, Florida and Nevada. Overseas, he served in Germany, Italy, Korea, Vietnam and Thailand. The Colonel is a Command Pilot with more than 5,900 flying hours and 335 combat missions in the F-100D and F-4E. He currently resides in Las Vegas, Nevada with his charming wife Fran. We thank him for this splendid report of a very hazardous mission and the sturdiness of both man and machine!

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"Remember, if you ever need a helping hand, you'll find one at the end of your arm... As you grow older you will discover that you have two hands. One for helping yourself, the other for helping others."

— Audrey Hepburn

Contrails From The Past

by Ed Rusinek

Dear Ed,

Last year, there was an ongoing debate in Space News about whether this country should or could reproduce the culture of Apollo. Walt Cunningham, John Logsdon and others wrote well and intelligently on the Apollo culture and its applicability today. The dialogue on the direction of the Space Program and the NASA culture needed to support that direction is important and must continue.

However, what all of these people failed to point out is that the Apollo culture was driven by the absolute uniqueness of the goal. They spoke of the Space Race and the clash of societal beliefs but they have missed the underlying motivation.

Those of us who worked on Apollo understood in the most elemental and deepest part of our beings that the first step on the Moon would be a unique event, not just in the history of humanity but in the history of life on Earth. In the 4 billion years of the solar system, no living creature had crossed from one natural body in space to another. Possibly, the event stands alone in the 14 billion years of the Universe.

The first footsteps of a living creature on the Moon was the result of the conscious, rational decision to apply resources, intelligence, imagination and the accumulated knowledge of our species to do something immensely difficult that was absolutely unique. It was not the emulation of something occurring in Nature. Even people in non-technological societies around the world understood this when they held up signs saying, "We Did It" to celebrate that first step.

Even if living creatures from Earth eventually stand on asteroids, or on Mars, or on planets circling other stars, these events will only be extensions of that first step. This basic, almost subconscious understanding of the complete uniqueness of the undertaking in all time; motivated the participants, drove the culture of Apollo and made it impossible to ever fully reproduce that culture on any other program.

I should add that central to the culture of Apollo was a singularly capable and dedicated organization, North American Aviation, having exceptional leadership and technical skills at all levels. We understood the historic importance of Apollo to all mankind. We knew we could accomplish any goal asked of us, even something as impossible as putting men on the Moon and on bringing them back safely and in just eight years from program start.

— Steve Evans, Foothill Ranch, CA

Ed's Ans.: I always felt that working for North American Aviation was a unique privilege in that I was associated with visionaries that looked far ahead to lead the Company, the Industry and the Nation. Unfortunately, much of that was lost when we became a subsidiary to the truck axle giant.

Dear Ed,

As a Silver Eagle, I really enjoy the Bulletin and look forward to every issue. I took our Guidance System to the North Pole in 1958 on the first voyage of the *USS Skate*, SSN-578. I retired as a project engineer from Autonetics in 1986 with 32 years of service.

— Roger Schmidt, Ogden, UT

Ed's Ans.: No one can ever accuse our retirees of having dull careers. Roger, can we get you to write an article about your experiences aboard a U.S. Navy nuclear sub under the ice cap at the North Pole?

Dear Ed,

Thanks for sending the Retirees Bulletin along Ken. I received it from a couple sources and it was very interesting and well done. It's certainly nice to know that so many have acknowledged the tremendous achievement that was the Space Shuttle.

— Chris (Captain Christopher Ferguson, STS-135 Commander)

Ed's Ans.: Thank you for your note. In our forthcoming issue, we respond to former NASA Administrator Michael Griffin about his opinion article in Aviation Week about the frailties of the Space Shuttle. We would be pleased to send you a copy.

Dear Ed,

Please renew my subscription for two more years – kudos to your entire staff for a terrific publication. Your editorial in the Fall Issue was absolutely outstanding. It really cleared up some of the cobwebs from my 90 year old brain with 32 years of memories of the LAD Engineering Department.

— James Goeckel, Venice, CA

Ed's Ans.: If you liked the last issue, you will love this issue. Jim, we are always happy to hear from our 90 years young retirees so hang in there and let's hear from you at 91!

Dear Ed,

Here is my check for another year of good reading and reminiscing about the 37 years I spent at NAA/Rockwell on the F-100; Navaho; Hound Dog; radars for the F-104, F-105, and F-111; antennas for the GPS Satellite and numerous guidance packages for tactical missiles. What a great company to work for. All with very talented people who became friends for life.

— James "Pat" Shea, Fallbrook, CA

Ed's Ans.: North American Aviation was a fantastic company and the combination of talented individuals can never be duplicated.

Dear Ed,

Thanks to a dear friend, I received a copy of your Fall 2011 issue. I truly enjoyed the whole issue, especially the statement, *"Leadership is everything and Dutch Kindelberger was that leader"*. Fortunately, when I was hired in June 1960 at the LA Division his presence and leadership still prevailed and was heard throughout our division.

Though I was hired as a mere File Clerk in Weapons System Support, the company offered me an amazing opportunity to continue "on the job training". To this day, I am still baffled and most thankful for my experiences, numerous jobs, bosses and peers for 38 years. Who knew! A newly transplanted

Island girl from Hawaii to an employee of a major aircraft company. My career started in Weapon System Support which changed to Logistics Support, then on to Property Management & Control which split into Property Management and Property Accounting. It subsequently proceeded to Facilities & Industrial Engineering which took me to Palmdale when we started to close down the El Segundo facility. Everyone I met, worked for and with continually made a tremendous impact on my life and I will forever cherish.

— Georgiana Winden, Las Vegas, NV

Ed's Ans.: Thank you for your charming and defining letter. One of the great strengths that North American Aviation possessed was that no one was treated as a "mere" employee. As in the entire Industry, women were paid less than their male counterparts but their skills were always recognized and appreciated.

"Washington is a place where politicians don't know which way is up and taxes don't know which way is down."

— Robert Orben

Congratulations and Best Wishes to

Roger and June Schmidt
of Ogden, Utah
celebrating their
60th Wedding Anniversary

James "Pat" and Sylvia Shea
of Fallbrook, California
celebrating their
60th Wedding Anniversary

Jerry and Joanna Manriquez
of Norco, California
celebrating their
50th Wedding Anniversary

Gene and Ruby Hales
of Stuart, Oklahoma
celebrating their
40th Wedding Anniversary

The Pleasure of Your Company Is Requested at the 50th Golden Anniversary Bald Eagles Reunion to be held on Saturday, April 28, 2012 at the Proud Bird Restaurant
11022 Aviation Blvd. (at 111th Street)
Los Angeles, CA

Attendance Cost: $33.00 with Advance Reservation
$35.00 at the Door – Name Badges and Meal Tickets Given at Door

Doors Open for Social at 10:00 A.M. Seating for Luncheon at 12:00 Noon

The Honorary Speaker will be James Albaugh, Executive Vice President of The Boeing Company and President and Chief Executive Officer, Commercial Airplanes. He will be providing an overview of the Boeing 787 "Dreamliner".

The meal choices are Prime Rib, Chicken or Vegetarian. Please indicate your choice on your check. Please make your checks payable to the Bald Eagles, Inc. and send them to:

Cathy Baker
Bald Eagles, Inc.
16372 Lakemont Lane
Huntington Beach, CA 92674

e-mail: Cathy.Baker12@gmail.com

Want to sit with your friends? Organize a group of eight and order tickets in one batch!
Have no friends? Come anyway and make new friends!

The Silent Majority

by Stan Guzy

ALLEN, ETHEL H., 78 – died on September 28, 2011. Ethel served for 35 years upon retiring and is survived by an extended family.

AST, MARGARET, – of Seal Beach, CA: Bulletin returned stamped "Deceased". Margaret served for 28 years at LAD. She was a splendid worker and friend.

BARROWS, ALLYN W., 80 – passed away peacefully in his sleep at home in Canyon Lake, CA on September 4, 2011. Allyn joined the U.S. Army after graduating from the University of Michigan and was assigned to the Aberdeen Proving Grounds. Completing his service, he came to California and obtained a Master's degree from the University of Southern California. After a brief stint at Northrop Aircraft, he joined the Stress Group at NAA in Downey. He had a key role in the development of the heat shields for the Apollo and Shuttle vehicles. He is survived by his wife Audrey.

BENNER, MELVIN L., 89 – passed away on October 2, 2011 just six days short of his 90th birthday. After serving in WWII, he joined NAA as an accounting manager in Defense Electronics Operations. In 1980, Mel was presented with the NAA/RI Management Excellence Award for outstanding achievement. He retired in 1984 after 22 years of service. He is survived by his loving wife of over 63 years, Audrey.

CAMPBELL, VICTOR L., 79 – of Carson, CA, died on July 16, 2011. Victor retired in 1994 from Space Division with 40 years of service in Quality Assurance. He was assigned to projects at LAD and Seal Beach and served on the Apollo and Space Shuttle programs.

CANAS, OPHELIA FLORES, 87 – passed away on October 6, 2011. Born and raised in Santa Ana, CA, she moved to Huntington Beach, CA to raise her family. She was a supportive, determined and goal striving person, who shared her strength with her family. She retired from NAA/RI in 1985 and is survived by her extended family.

CARCHIDI, JOSEPH M., 79 – passed away peacefully at home in Fullerton, CA on October 7, 2011 after a courageous battle with cancer. A Korean War veteran, Joe joined NAA in 1955 and worked on the Apollo and Space Shuttle programs. He retired in 1993 from Space Division GSE with 28 years of service. He is survived by his loving wife of 52 years, Sally.

COZIER, WILLIAM A., 79 – died peacefully on October 20, 2011. Bill had a long career at NAA/RI from 1975 until 2010 as a software engineer on the Space Shuttle program. He designed the Backup Operating System (BOS) for the Space Shuttle Backup Flight System (BFS). He was known as the "Father of the BOS". He is survived by his beloved wife of 42 years, Camile Cozier.

CREAGH, DON W., – of Santa Cruz, CA: Bulletin returned stamped "Deceased". Don retired from LAD in 1990 with 24 years of service.

CROSS, ROBERT O. "BOB", – of Grand Junction, CO: Bulletin returned stamped "Deceased". Bob retired from Autonetics in 1986 with 30 years of service.

CROSS-HAYES, CAROL J., 77 – went to her heavenly reward on August 25, 2011, after a two year battle with pancreatic cancer, with her husband and children at her side. Carol joined NAA at Downey in the early Sixties, took a few years off to raise her family, and then returned to NAA/RI to become a Contract Administrator. She retired in 1990. She is survived by her husband Jack.

CURETON, WARREN D. "DAVE", 86 – of Fullerton, CA passed away on August 30, 2011. Dave came to Space Division in 1963 after serving at Grand Central Rocket and Hughes. His efforts were directed towards electronic systems, especially the Apollo Crew Displays & Controls. He advanced from MTS to Supervisor to Astronaut Consultant. After the Apollo 1 fire, he dedicated himself with great intensity in the effort to ensure astronaut safety. Dave worked on the Space Shuttle General Purpose Computer hardware and was consulted on the Teal Ruby satellite and various Star Wars programs. He was recognized as an Engineer of the Year nominee. After 25 years of service, Dave retired in 1987 and renewed his passion for music. Dave was Choir Director at the Brea Congregational Church, played the saxophone with the Eastside Christian Church Worship Band and the bassoon with the Evangelical Free Orchestra. He was also a member of the Bones West Trombone Choir and a barbershop choir. He was a man of note! Dave is survived by his wife of 44 years, Betty.

DOBSON, ROBERT K., 85 – of Torrance CA, passed away peacefully at home on August 6, 2011. Bob retired from Space Division in 1987 with 40 years of service. He is survived by his loving wife of 60 years, Pauline.

ECKARD, RAYMOND "RAY", 77 – passed away at his home in Roseburg, OR on September 2, 2011 from complications associated with cancer. He is survived by his wife Mary.

JACOBI, WILLIAM E., – of Fallon, NV: Bulletin returned stamped "Deceased". Bill retired from Space Division-Palmdale in 1983 with 28 years of service.

JOYNER, CHARLES F., – of Granbury, TX: Bulletin returned stamped "Deceased". Charles retired from Space Division with 30 years of service.

JURGENS, AUDREY, 93 – passed away in Cody, WY on October 25, 2011. Audrey was an independent spirit. Graduating from high school in Denver, she worked as a typist with the U.S. Forestry Service. During WWII, she joined the U.S. Army Women's Army Auxiliary Corps (WAAC), where she received additional clerical training and was sent to OTS. She served and was discharged as an officer. She graduated from Ohio State University on the G.I. Bill and joined NAA at the Columbus Facility. She served for 29 years, finishing her career in Personnel. Audrey later returned to the mountains of Wyoming and enjoyed the great outdoors.

MAIER, ARTHUR C., 100 – of Rancho Palos Verdes, CA. passed away on August 3, 2011. Art had served at LAD for 36 years when he retired. He was a president of the Palos Verdes South Homeowners Association and was active in the formation of the city of Rancho Palos Verdes.

NICHOLS, WILLIAM E. "NICK" or "BILL", 84 – passed away in Columbus, OH on October 26, 2011. Bill retired from the Columbus plant in 1970 after a 20 year career primarily dedicated to the T-28 and the NOMAD program. He was the primary specialist technician serving as a liaison converting disposed T-28As into FENNECs for the French Air Force to be used for counter-insurgency in Algiers. His coordination was performed with PAC Aero in Burbank, CA and SUD Aviation in France. He was a member of the ANA Helldivers Squadron.

NORTON, MYLIN C., 87 – passed away on September 19, 2011. He served in the U.S. Coast Guard and U.S. Navy during WWII and was stationed in Japan during the Korean conflict. Mylin was employed at NAA/RI as a Materials Contract Administrator at Downey on the External Tiles Program for the Space Shuttle Development project. Mylin will be dearly missed by his wife of 59 years, Lois "Honey".

OGLE, BILL, 87 – passed away in Chickasha, OK on October 1, 2011. Bill joined NAA at LAD in Material and moved to Transportation as a truck driver. As needed, he transferred to an NAA operation at Douglas in Long Beach, Downey and finally at Autonetics as a private chauffer. When he retired, he had over 40 years of service with the company.

SAMMONS, GERALD D., 72 – passed away on September 10, 2011 at the home of his daughter. Gerry was a Silver Eagle subscriber of the Retirees Bulletin. He had worked at Autonetics for 37 years before retiring in 1995. Gerry was predeceased by his wife, Joan.

SHIMONO, GEORGE F., 78 – passed peacefully on October 20, 2011. George was a veteran of the U.S. Air Force during the Korean conflict. He retired from NAA/RI after 35 years of dedicated service in the Engineering disciplines. George is survived by his loving wife Barbara.

SWEET, HAROLD R., 89 – of Olympia, WA, passed away on October 9, 2011. After military service in the South Pacific, Harold obtained an M.S. degree in Aeronautical Engineering from Rensselaer Polytechnic Institute. At LAD, his greatest achievement was being a part of the X-15 Design Team. He retired in 1977 with 29 years of service.

LOST SHEEP, BULLETIN RETURNED WITH NO FORWARDING ADDRESS

C. ERNEST "ERNIE" KELSO – MEDFORD, OR

THOMAS W. MILLER – WESTMINSTER, CA

INEZ G SEEFRIED – CYPRESS, CA

PHILIP D. WILTSE – ALTOONA, IA

PAX DOMINI SIT SEMPER VOBISCUM

NORTH AMERICAN AVIATION
RETIREES BULLETIN
P.O. Box 3797
Seal Beach, CA 90740

North American Aviation Retirees Bulletin
"Where The Best Never Rest"

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IF THE DATE ABOVE YOUR NAME IS DECEMBER 2011 AND YOU HAVEN'T YET RENEWED –
THIS IS YOUR LAST ISSUE!



Photo from the Matt Wallace Collection

In April 1968, then-Major Matthew B. Wallace received the F-100D 300 Mission Patch from Colonel Herndon Williams, 35th Tactical Fighter Wing Commander, upon completion of his 300th and final F-100D Mission at Phan Rang Air Base, Vietnam.

NORTH AMERICAN AVIATION
Retirees Bulletin
"Where The Best Never Rest"

Spring 2012

Inside:

THE BORROWED BUICK AND OTHER TALES by Bill Schmitt

UNDER THE POLAR ICE CAP ABOARD THE USS SKATE by Roger Schmidt

THE MANY FACES OF NORTH AMERICAN AVIATION by Mike and Rebecca Aguilar



Photo courtesy of the Roger Schmidt Collection

AN AUTONETICS FINEST HOUR – On August 12, 1958, the nuclear submarine* USS Skate, *SSN 578, broke through the ice cap and surfaced at the North Pole. On board were two Autonetics engineers, Zane Sandusky and Roger Schmidt, accompanying the N6A Inertial Navigational System in a very successful demonstration of the Autonetics system guiding the submarine under 2,405 miles of ice up to 54 feet thick.

NORTH AMERICAN AVIATION
Retirees Bulletin

North American Aviation Retirees Bulletin, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAA Retirees Bulletin can be contacted at The Boeing Company, Seal Beach facility by phone at (562) 797-3836. Send mail to:

North American Aviation Retirees Bulletin
P. O. Box 3797
Seal Beach, CA 90740

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Dear NAA Retirees Bulletin Subscriber

Another year has passed and we are still rising to the challenge. However, we regret to report that our list of subscribers has taken another drop. It is regrettable, but to be expected. We cater to the checkout generation and must anticipate these setbacks.

So many of you have expressed your concurrence with Larry Korb's response to the Michael Griffin article that we are convinced that we are not the lone wolf howling in the wind. As long as NASA was the customer, we had to accept the blame for their sophomoric decisions. However, no more! Let the truth be known and the blame land where it belongs!

As mentioned previously, the **50th GOLDEN ANNIVERSARY BALD EAGLES REUNION** will be held on Saturday, April 28, 2012 at the Proud Bird Restaurant. The speaker will be James Albaugh, Executive Vice President of the Boeing Company and President and Chief Executive, Commercial Airplanes. He will speak about the new Boeing 787 "Dreamliner" and provide a Boeing overview. Since this should be a splendid gathering of old friends, why not get a group together and make this a real Golden Anniversary celebration! To commemorate this 50th Milestone, the Bald Eagles Board of Directors are preparing special mementoes for all who attend. To add to the festivities, Martin "Buzz" Holland, the last survivor of the original Dundalk group, will attend so try to be there!

One of the joys of being the Editor of the Retirees Bulletin, is to find NAA people with a wonderful story just waiting to be told! Such is the case with our newest author, Roger Schmidt. He and Zane Sandusky were selected to represent Autonetics on a voyage, on board the nuclear submarine *USS Skate*, to the North Pole to test the N6A Inertial Autonavigator under the Arctic Ice Cap. As you read this story of these two men, your heart will swell with PRIDE because they represent the thousands of brilliant, capable and dedicated men and women that proudly wore the NAA badge – whether Numbered, Yellow, Gray or White. No task was too hard and nothing was impossible!

Appropriate for this 50th Anniversary of the Bald Eagles, the story of the great migration of the 50 NAA families from Dundalk, Maryland to Inglewood, California as seen through the eyes of a nine year old. Bill Schmitt tells how his Dad packed up the family in 1935 into a borrowed Buick and took the road to cross the entire country. These were not simple fruit pickers seeking El Dorado in California but skilled, dedicated engineers and craftsmen ready to "hit the ground" running and start building airplanes. The Depression was at its worse but Dutch Kindelberger "gambled" everything on the determination and loyalty of these people to hold out until the first airplanes came off the line and revenue would be forthcoming. They did not disappoint him.

With the New Year, we are starting a new series of articles about the folks that made North American Aviation, Inc. the great company that it was. These are not the ones who always received mention in the Skywriter or Snoopy awards but they were the bulwark of the thousands that carried the company to success. To our good fortune, to initiate this series, we found a couple that started at North American Aviation, worked at NAA, met at NAA and married at NAA. Without further adieu, we introduce Mike and Rebecca Aguilar!

Our friend and colleague Sonnie Robertson is still sidelined with her vision issues. Thanks to the system she imposed on the subscription list, Stan and I are able to update the renewals and new subscriptions for 2012. Please remember her in your prayers. Prayers are never wasted, so please be generous with them! — Ed Rusinek

The Borrowed Buick and Other Tales

by Bill Schmitt

In the late 1920s, my father, Frederick W. Schmitt, went to work for the Berliner-Joyce Company, located in Dundalk, Maryland as a foreman of the machine shop, welding and metal fitting department. The plant was small and contracts were scarce. In a series of mergers, it became the General Aviation Manufacturing Corporation. In 1934, when Dutch Kindelberger was brought on board, the company consisted of about 200 employees and had a dwindling net worth of about $11,000.00. The name of the company was changed to North American Aviation Inc. and, with the new management, the company succeeded in winning two Army Air Corps contracts. One for a trainer and the other for an observation aircraft.

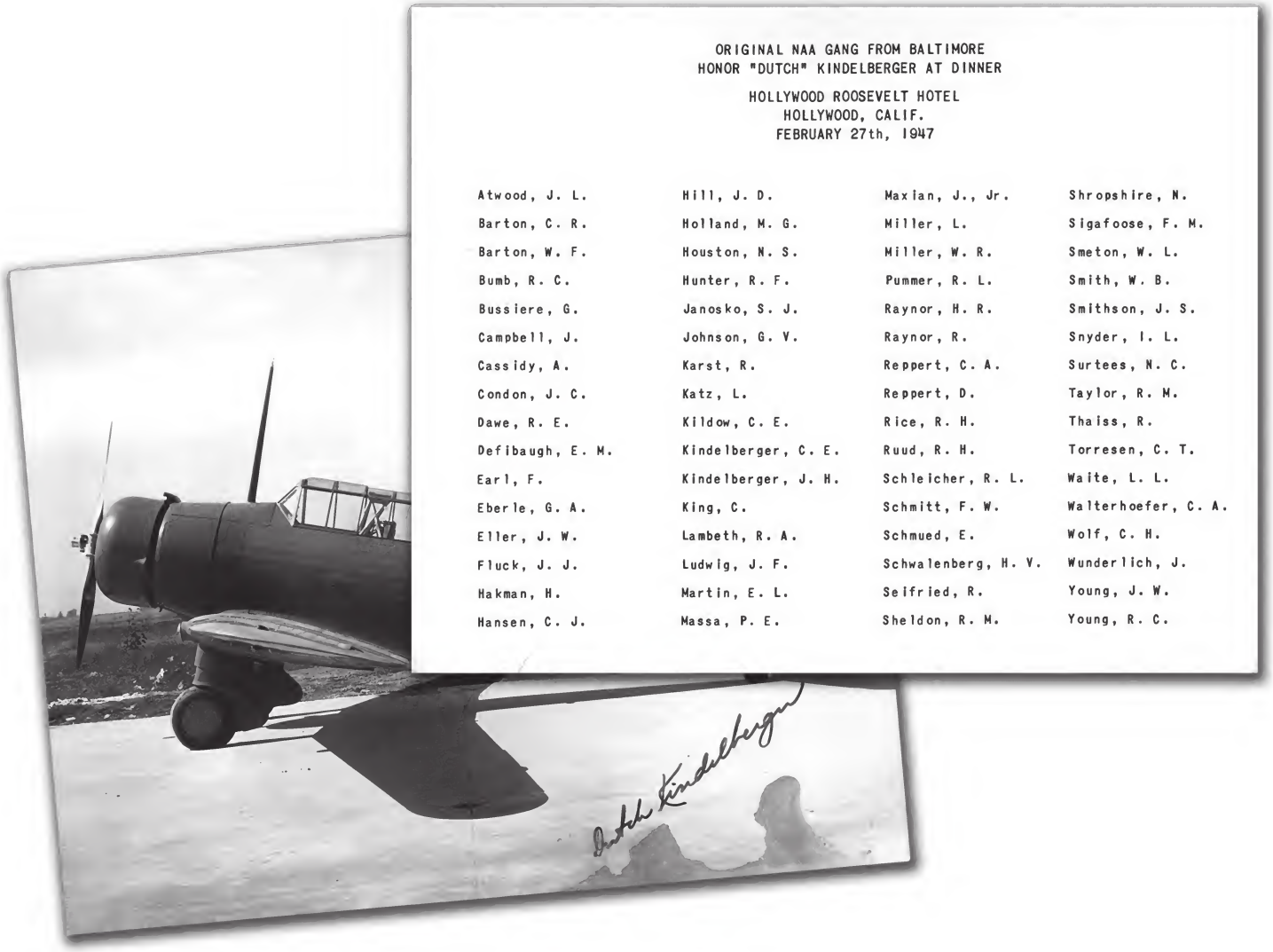
In October 1935, on the basis of the new contracts, Dutch told the employees that he was moving the firm to Inglewood, California. He offered everyone a job if they were willing to relocate. Each would receive $500.00 to cover traveling and moving expenses. Fifty of them accepted the offer.

My Dad came home and told us that we were moving to California. I was nine at the time. In early November, the movers came, crated up our furniture, loaded up the moving van and took off for the land of sunshine! We did not own a car but Dutch asked my Dad if he could drive his Buick Roadmaster to California for him. My Dad agreed. The Buick had a spare tire mounted in each front fender. Our luggage was



Photo from the Schmitt Family Collection

In 1954, Frederick "Smitty" Schmitt was the 16th NAA employee to receive the 25 Year Service pin. The presentation was made by "Dutch" Kindelberger himself.



ORIGINAL NAA GANG FROM BALTIMORE
HONOR "DUTCH" KINDELBERGER AT DINNER

HOLLYWOOD ROOSEVELT HOTEL
HOLLYWOOD, CALIF.
FEBRUARY 27th, 1947

Atwood, J. L.	Hill, J. D.	Maxian, J., Jr.	Shropshire, N.
Barton, C. R.	Holland, M. G.	Miller, L.	Sigafoose, F. M.
Barton, W. F.	Houston, N. S.	Miller, W. R.	Smeton, W. L.
Bumb, R. C.	Hunter, R. F.	Pummer, R. L.	Smith, W. B.
Bussiere, G.	Janosko, S. J.	Raynor, H. R.	Smithson, J. S.
Campbell, J.	Johnson, G. V.	Raynor, R.	Snyder, I. L.
Cassidy, A.	Karst, R.	Reppert, C. A.	Surtees, N. C.
Condon, J. C.	Katz, L.	Reppert, D.	Taylor, R. M.
Dawe, R. E.	Kildow, C. E.	Rice, R. H.	Thaiss, R.
Defibaugh, E. M.	Kindelberger, C. E.	Ruud, R. H.	Torresen, C. T.
Earl, F.	Kindelberger, J. H.	Schleicher, R. L.	Waite, L. L.
Eberle, G. A.	King, C.	Schmitt, F. W.	Walterhoefer, C. A.
Eller, J. W.	Lambeth, R. A.	Schmued, E.	Wolf, C. H.
Fluck, J. J.	Ludwig, J. F.	Schwalenberg, H. V.	Wunderlich, J.
Hakman, H.	Martin, E. L.	Seifried, R.	Young, J. W.
Hansen, C. J.	Massa, P. E.	Sheldon, R. M.	Young, R. C.

Announcement from the Schmitt Family Collection

Recognizing his fantastic accomplishment in moving them across the continent to California to become the masters of the industry, the original 50 employees honored "Dutch" Kindelberger at a Dinner in 1947.

secured on the running board with a folding gate. So, in the luxury of Dutch's Buick; my Dad, my Mom, my two Sisters, Muriel and Mary, and I departed Maryland and headed for California!

The trip across the country was uneventful except for a heavy sandstorm in Texas. We were accompanied by another family, the Carl Walterhoefers. He later became General Foreman of Experimental Department 9.

We arrived in Los Angeles on November 11th. An Armistice Day parade was in progress. We continued to Santa Monica where we stayed at a motel for a few days. My folks found and rented a furnished house at 16th Street and Wilshire Boulevard. We went out on a Sunday to visit the Inglewood Plant. It was about 75% complete and surrounded by mud. The East High Bay building was complete but the office building which housed Dutch and the engineers on Imperial Highway and Aviation Boulevard was still under construction.

Since all of us were new arrivals in California, it became customary for the families to meet at the plant on Sundays and exchange information about homes for sale or rent, where to shop for certain items and other tidbits of gossip. A couple of barnstormers would show up on the adjacent asphalt strip called Mines Field and offer rides for a few dollars in their ancient biplanes. North of the strip stretched miles of lima bean fields. At times, the farmers got careless and plowed up parts of the asphalt to plant their beans.

To provide the families some social life, Dutch would invite everyone to a party in a rented hall. Sometimes, the parties got a bit rowdy and we were invited by the management never to come back

Having worked as a shop planner and estimator in his job at Berliner-Joyce, my Dad organized the Planning Department and, later, the Material Control Department. After aircraft production began, he joined Dutch Kindelberger's staff as Chief of Contract Pricing. When the company became a corporate giant, Dad was named Executive Director – Contract Pricing. He retired in 1966 with 37 years of service.

I enlisted in the Army in 1943 and served in the South Pacific with the 41st Infantry Division. Returning home in 1946, I enrolled in college and obtained my degree in 1950. I was hired at LAD for Manufacturing Scheduling on the B-1. When the program was cancelled, I moved to Rocketdyne to work on the MX Missile Stage IV. I retired in 1984 with 34 years of service.

Under the Polar Ice Cap Aboard the USS Skate

by Roger E. Schmidt

Background

The year 1958 was named the International Geophysical Year (IGY). Many countries were involved in various activities, and the USA participated by providing scientists to the team assigned to establish a floating ice station on the polar ice cap. The idea was to traverse the Arctic Ocean by riding the moving ice cap, while recording wind, temperature, etc. readings and plot their movement. This trip was expected to last at least throughout the IGY.

The U.S. Navy decided to get involved by using its new nuclear submarines. Earlier in 1957, the Navy came to the Autonetics Division of North American Aviation and inquired into the possibility of supplying one of our Inertial Navigational Systems to a submarine for under ice navigation. This method of navigation was required because the normal ship's Gyro Compass Systems will not work near the northern latitudes. All magnetic compasses only point to the North Pole and are rendered useless for actual positioning when approaching the North Pole.

Autonetics decided to adapt the complete forward package (nose cone) assembly which housed the Inertial Guidance System for the Navaho Missile (XSM-64A), and install it in the submarine. This system was designated as the N6A Inertial Autonavigator. The "Brain" was the NATDAN (North American Transistorized Digital Analyzer) computer.

We had decided to mount a backup computer on the bulkhead (wall) next to the system. This unit was electronically paralleled to the primary NATDAN. This precaution was taken as transistors were rather new and their reliability factor was not yet well established. The N6A was originally designed for a short missile flight of several hours and we were going to depend on its accuracy and reliability for weeks under the ice.

This complete forward package unit was installed in a vertical position (less floor space). First, the stable platform was removed and mounted on the deck (floor) near the electronics in the forward package. In order to use the information from the system, we had to install the monitoring equipment used in the Engineering Lab at Autonetics. In the Navaho missile, all of these signals went directly to control surfaces, engines, etc. All the computer information was in a binary format (ones and zeros). This was presented on an oscilloscope screen and read out manually in an octal format. The octal numbers were then again manually converted to digital numbers to ascertain our position in latitude, longitude, speed, etc. A complete set of this information was manually recorded every five minutes. A set of readings was comprised of nine different computer locations which had to be manually selected prior to read out. This reduced data was then given to the ship's navigation personnel for plotting, positioning, etc.

Autonetics was only allocated two men to accompany the system, keep it operating, perform all the necessary read outs, and interpret their meanings to the ship's navigator. This required people with a thorough understanding of the N6A Inertial Autonavigator. Zane Sandusky was selected as the responsible engineer and he selected me, Roger Schmidt, as his assistant and systems technician. We had been working together in the Engineering Lab on the N6A.



***The Forward Package of the Navaho Missile mounted vertically with the Stable Platform adjacent on the deck of the* USS Skate**

Set Up, Checkout and Shakedown Cruise

The N6A Inertial Navigation system, along with all the peripheral equipment, arrived at The Electric Boat Company in New London, Connecticut in early May 1958. The *USS Skate* was in the manufacturer's dry dock while being outfitted for the polar voyage.

The N6A system was shipped from the Downey Autonetics facility. The team from Autonetics was there to install and test the system. This was done and first power on tests occurred on June 6th. Prior to power on, the first major hurdle was modification of the N6A liquid cooling system. In the Navaho Missile, this coolant was circulated via a pressurized closed loop. On the nuclear submarine, no pressurized lines were allowed. Consequently, we redesigned the system coolant line into a vacuum operated closed loop which worked adequately. This was found to be acceptable by Navy Standards for a nuclear submarine.

The N6A system was completely checked out in the operational mode and found ready for sea trials. We left port on July 18, 1958 for the sea trial. This was a one day cruise with



The Backup Computer (NATDAN) wall mounted on the left and Power Supplies on the right of our work table used for reducing data



The Author taking a coffee break next to the closed up and operating Backup NATDAN

many extra civilians on board to check out all the special equipment which had been installed for the polar trip. Two specialists (programmers) from the Downey facility accompanied us to check out the new program for the computer. This program was designed to allow operation at 0 degrees north latitude. It was needed to fool the system into thinking that the North Pole was the Equator, so that the submarine could cross over without recalculating its direction.

Everything checked out perfectly and the N6A was declared ready for the polar cruise. We returned to the New London submarine base and unloaded all the extra checkout personnel and began to prepare the boat for our polar trip. They loaded food, supplies, etc. for the planned 60 day journey.

The Journey Through the Ice Cap

The following was a day-by-day account as originally written in my personal journal.

Tuesday, July 29, 1958: We checked out of the New London Motel where Zane and I had been living during the system setup and checkout period. A very busy day as we moved on board the *USS Skate* to live there for the next two months.

I thought I had sent most of my personal things home (via the Post Office), but I still had almost too much stuff for the one small locker assigned to me. I did take along one suit and two shirts, just in case we did stop in a foreign port. I certainly had hopes of visiting a foreign country after all the last minute rush and confusion of obtaining a passport at the last minute.

Zane and I had flown to New York City to get these passports. They were dated July 25, 1958. How we accomplished this in one day in New York City was just a miracle. We had both taken our birth certificates along for this trip as recommended by our Autonetics personnel department. I do not know why this directive was issued, as I'm sure they did not know what our itinerary would be. We certainly didn't. However, it was fortunate for us that we had the required items for the passport.

Our bunks (beds) on the *Skate* were in the same room as our N6A and all the equipment. We lived, worked, and slept all in an approximately 10 by 15 foot space. We only left it to go to the galley to eat or for bathroom breaks. Also, may I mention there were no windows either! Not that I ever had time to look out them if there were.

Wednesday, July 30: @ 0130 hours (1:30 a.m.) we left New London and headed for the open sea. We turned the N6A Inertial Navigation set power on and it remained on until we stopped in Bergen, Norway on August 23 @ 3 p.m. We had no problems or system failures for the entire cruise.

When we left New London I was working the mid-shift from 12 noon to 4 p.m., then eight hours off and then back to work from midnight until 4 a.m. I did my sleeping during the day shift, so I could watch the movie that was shown every night @ 8 p.m. The crew took 30 films along so this meant reruns later in the cruise.

Thursday, July 31: I woke up about 10 a.m. with very rough seas pounding the submarine! We were on the surface to repair the snorkel system which had developed a leak. Repairs required that we needed to be on the surface for about four hours.

When we finally returned to our normal cruising depth of 600 feet, it was a big relief! When traveling at 600 feet under the water, it rides as smooth as if you are sitting by your kitchen table. The North Atlantic Ocean is not a friendly place to be on the surface! The huge waves really toss a ship as small as a submarine around a lot.

The medics are wearing mourning bands today, because the last of their fish died. As an experiment, we are carrying all types of plant life and fish to see how our air, environment, etc. affects them. The fish lasted 2 1/2 days. The plants are all over the boat and still look green.

Friday, August 1: We ran out of fresh milk, so now the cooks are mixing that powdered stuff. I don't know if I will get used to that or not. We are making good time, but it will still be another week before we go under the ice.

Saturday, August 2: Today passed uneventfully except I did loan my college trigonometry book to one of the ship's officers who was getting ready for a promotion test. I had taken some books along since I was going to college at night when home in California. I thought if I had some spare time I would study. But, this didn't happen as I was kept very busy.

Before we left, we had two Navy seamen who had gone to school at Autonetics in Downey to learn the basics of our N6A Inertial Autonavigator. Included was a course in how to read the scopes and record the information. This way, each one of them and I would take a four-hour shift and then be off for 8 hours. This left Zane free to reduce the data and relay the information to the navigator.

Sunday, August 3: This was my first Sunday under 600 feet of water. Captain Calvert held an informal church service in the crew mess hall. I was impressed. The captain is a devout Lutheran and did a terrific job. I had not expected to have church services out in the middle of the Atlantic Ocean under the water.

In the afternoon we surfaced to send radio messages. While surfaced, we heard a news broadcast on BBC (the British News Station). They claimed reliable sources put the *Skate* halfway to the ice pack in a "race" for the North Pole! Where BBC got this information was a mystery. However, they were pretty close to accurate.

Monday, August 4: Today was uneventful. We were just off the coast of Greenland, and heading for the Denmark Straits. Don't look for them on a map, but they really are between Greenland and Iceland. Today we received a briefing on our plans. It looks like the *Skate* will make several runs under the polar cap to the North Pole and then to some Air Force weather station called Alpha. We have been at sea for seven days now. It seems like a long time, yet I have been so busy that the time has really gone fast. I guess that is the secret: Keep busy!! I don't care for this split shift schedule. I just get in bed and it's already time to get up. Only three hours of sleep at a time doesn't appeal to me. Today, the ice cream freezer broke down. I hope they can fix it. Homemade ice cream tastes pretty good after powdered milk and coffee all the time. I am still on the 12 to 4 shift.

Wednesday, August 6: Today was uneventful. I got to watch the nightly movie today. It was very good this time. It was "High Society" with Bing Crosby and Grace Kelly. I was happy I had not seen it before the trip.

We put the system on free inertial today and everything looks fine. We are now passing through the Denmark Straits between Greenland and Iceland. There is an old World War II minefield ahead. We are going next to it, I hope!

Thursday, August 7: Just after I got off at 4 a.m. we crossed the Arctic Circle @ 0410. The "Blue Nose" ritual was held for those who were first timers. This ritual is similar to the King Neptune Ceremony held when crossing the equator. Fortunately for us, the civilian guests on board were not initiated like the young sailors!

We had some excitement this morning. Sonar picked up what we thought was floating ice above us. This is unusual for this area in the summertime. Later, it proved to be a whale and big starfish.

The ship's gyro compass went out, so we are using our N6A system for navigation from now on. This is now our only operational navigation tool.

Friday, August 8: It's just another day at sea. About the only exciting thing that happened today was the crew fired some water slugs out of the torpedo tubes to test everything out. They used air to push the water slugs out and it bled back into the boat with a loud bang!! It really sounds like a cannon going off. We are expecting to reach the ice tomorrow night.

Saturday, August 9: What a day it was! I hardly know where to start. First, we were told the *Nautilus* had made it from Pearl Harbor and under the North Pole and came out from under the ice cap this morning. I knew this was underway as my Autonetics group leader, Tom Curtis, was on board with another N6A Autonavigator. But, this was very disheartening news for the *USS Skate* crew. Talk about a loss of morale! You could hear a pin drop at dinnertime. The crew had all expected to be first to the North Pole, but now we are going to be second to the *Nautilus* again.

We are currently surfaced off the coast of Spitzbergen, Iceland, which is our last land fix before going under the ice cap.

We saw a Russian boat while on the surface. We had "Battle Stations" alert, but they steered away from us. Just a fishing trawler, I guess. Our plan is to go straight to the North Pole and back out in about five days, and then go in a different way to map the ocean floor. The Navy says our job is the important job and the *Nautilus* was just for publicity. But while that is correct, we sure have a boatful of disappointed men tonight. The captain declared a holiday schedule to relieve the strain. That meant an afternoon movie at 1:30 p.m. and another one tonight.

Anyway, I sure am getting lonesome for my wife! That's about all everybody talks about: their wife or girlfriend.

Sunday, August 10: We went under the ice cap this morning at 0530. Then about 10 a.m., we surfaced through a polynya, which is an open pool or lake found in the ice pack. These openings were located by our special reverse-mounted sonars pointed up on the bow of the *Skate*. Normal down-facing sonar are used to determine the depth of the ocean water. However, by looking up, we could not only find openings, but we could measure the thickness of the ice. We saw and took pictures of a giant polar bear. The crew ran some experiments before we dove back down under the ice and had church services in the afternoon. This time, instead of the captain leading the service, one of the Navy chiefs conducted the service. The movie tonight was "The Rainmaker" with Burt Lancaster and Katharine Hepburn.

We are heading due north for the North Pole, now at 85 degrees North latitude and 10 degrees East longitude. That means 300 miles to the pole. We should make that by late Monday or early Tuesday.

By the way, I was told today by one of the officers that I have one of the best beard growth on the boat. I haven't shaved since we left New London and it's really heavy, long, and streaked with grey!

Monday, August 11: We spent all day under the ice cap. Everything looks good "system wise". Zane and I started working eight hours on and four off because of all the added calculations to be made closer to the North Pole.

Tuesday, August 12: We made history today! We reached the Pole at 0147, went past it, and started looking for a "lead" to surface through. Leads are long, narrow cracks in the ice cap. The captain tried some leads, but they were too dangerous so moved away from the Pole and looked for more. We finally found a large one at 1400 hours about 40 miles from the North Pole. We surfaced, took pictures of sun shots, etc. The captain decided to remain on the surface all night.

I went outside and the sun about blinded me after two weeks of artificial lights. The water is a beautiful blue and the ice is awful rough with high peaks, edges, etc. It appears to have been broken up and then refrozen. One sure can see a million miles it seems, just as clear. The sky is blue and so is the water. The temperature is just at 32 degrees, so it's not so cold. Of course, it is the middle of the summer up here. Oh yes, I went up again at 1 a.m. in the morning and the sun is up! But as pretty as it is, it's an awful lot of nothing. No place to stay for long.

Wednesday, August 13: We went back under the ice cap and headed for a weather station called Alpha. We should get there tomorrow.

Thursday, August 14: We located IGY Station Alpha at about 10 p.m. We surfaced in a polynya about 1/2 mile from camp. What a place to be! The Alpha crew is supposed to stay for six months. One guy came on TDY for 20 days and has been here for 4 1/2 months! The ice started breaking up and they can't land an airplane! They drop food and supplies by air parachute. These guys were sure glad to see us. Our cook made a big cake and ice cream for them. They gave the sailors some beer. We also picked up a big piece of polar bear meat and a large 12" x 12" x 10' post. The crew planned to use the post to make the "North Pole" by painting it red and white like a barber shop pole to display when we get back home. It will have a flag stating *"The* Nautilus *was there first, but the* Skate *brought it back"*.

The weather was foggy with drizzly rain and a cool 30 degrees. I couldn't imagine being there for at least six months.

Friday, August 15: The Air Force crew from Ice Station Alpha toured the submarine and gave the sailors a tour of their camp. It was quite a day, but with the miserable weather, I stayed onboard and skipped the tour.



The* USS Skate *surfaced near the North Pole in a "Lead" or "Polynya" between the Ice Ridges

We were supposed to have dinner at the camp with the Air Force Major, but about 4 p.m., the hole in the ice we had surfaced through started closing up, so we decided to leave pretty quickly. It took some time to round up all of the touring sailors, but we dove back under the ice about 8 p.m.

We left Ice Station Alpha and headed for the Pole from another direction this time.

Saturday, August 16: We surfaced closer to the Pole this time. It's very pretty here. The ice was rough with some peaks that were 30 feet high. There's still no sun, it's just foggy and drizzling. We get news from the "Voice of America" radio station, and also from Washington, D.C. They have arranged for us to go to Bergen, Norway for two days, and then on to Copenhagen, Denmark for five days. So it looks like they are happy about our success so far. Also, I'll get to use my passport after all.

Sunday, August 17: Zane and I have been working eight hours on and four hours off again as we get closer to the Pole, but we met some floating ice and moved away. We crossed the North Pole again at 2300.

We circled the Pole and crisscrossed the area. Now we are heading out again. This time it is on to Norway! Everything still looks great as far as the N6A System goes.

Morale is pretty high with anticipation of the foreign ports. As for myself, I'd just as soon head for home right now. I sure have been dreaming a lot lately. Also my legs are getting awfully weak and tired in the knees. I guess I'm not getting enough exercise. So now when we surface, I go up on deck and run around to exercise.

Monday, August 18: We surfaced in a large polynya today. We received more news via the radio while surfaced. The crew ran more tests while surfaced. Most of these tests are classified, so I am unable to discuss them.

Tuesday, August 19: It was just a normal day at sea under the polar ice cap. We surfaced late in the evening and took some line fix readings by the ship's navigator to see how accurate our inertial autonavigator was after 10 days under the ice. The system readings were excellent and the Navy personnel were very impressed. We expect to leave the ice pack sometime tomorrow and head for Norway.

Wednesday, August 20: We finally broke down and washed our clothes today. I was out of socks, so Zane and I put together a load of white stuff and a load of dark socks, and T-shirts. Maybe I ought to talk to Sears and advertise their Kenmore washers and dryers, which we used under the polar ice cap. Anyway, I'm glad that is done. Zane is a bachelor, but I'm lucky to have a beautiful wife who does my laundry!

We passed out from under the ice cap about 1730 and later surfaced about 2000 hours to send out radio messages. It sounds like they want us to go to several foreign ports. Propaganda, I suppose.

Since the *Nautilus* is going to New York for a hero's welcome, maybe they figure the guys on the *Skate* feel slighted and so

they are giving us all kinds of foreign ports since we actually did get a lot more data, stay longer, etc. So now there is no telling when I'll get home! But at least I plan on calling home from Norway on the telephone.

Thursday, August 21: What a day! Today was Immunization Day. All those overseas shots you hear about, well, I got all four: Tetanus, Small Pox, Typhoid D, and Typhus! I'm really stiff and rather woozy.

We were told to expect to get to Bergen, Norway Saturday afternoon about 4 p.m. and leave Sunday at 1 p.m. Then we will be on to Oslo, Norway.

Friday, August 22: My small pox shot is reacting and so is the typhoid. So that means I need a booster shot – lucky me! Tomorrow we get into port, so I started writing letters today. I wrote 10 so far. The Copenhagen stop has been cancelled, so maybe we will be home sooner than I expected.

The King of Norway is coming aboard tomorrow and is going to go on a short cruise with us. So I guess I'll get to see him.

The rumor of the day has us going to Antwerp, Belgium to see the World's Fair, which is there this year. We will have to wait and see.

Saturday, August 23: We docked in Bergen, Norway at 1455 hours.



Docked at Oslo, Norway, Zane Sandusky and Roger Schmidt (standing) in front of the System Monitor Panel prepare to meet guests

Ports of Call

Rather than detail our travels in Europe, I will simply list the ports we visited. From August 23rd until September 24th, we stopped in Bergen and Oslo, Norway; Denhelder, The Netherlands; Cherbourg, France; Zerbrugge, Belgium; Boston, Massachusetts; and lastly, we returned to New London, Connecticut.

Trip Statistics

- Time spent under the Polar Ice Cap
  – 10 days, 14 hours
- Distance traveled under ice
  – 2,405 miles
- Surfaced through ice
  – 9 times
- Thickness of ice
  – Up to 54 feet
- The crew of the *USS Skate*
  – 10 officers,
  – 87 enlisted men,
  – 9 civilians (technicians & scientists)
- Estimated time of travel
  – 54 days, 7 hours
- Estimated distance traveled
  – 12,000 miles
- Estimated distance submerged
  – 10,100 miles
- Estimated distance surfaced
  – 1,900 miles
- The *USS Skate*, SSN 578, was one year old prior to this voyage

Results of the Cruise

Scientifically, the *Skate's* Arctic Cruise resulted in far more information about the North Pole region than was gathered by all previous expeditions combined.

For military men, the *USS Skate* proved that submarines can go under the polar ice pack, stay there, and surface regularly for operational missions.

For Autonetics, this voyage resulted in the capture of large Navy contracts to design and build the N7A SINS (Ships Inertial Navigation System). Today, these N7A Inertial Autonavigators are found on every Navy submarine and most of the surface ships as well.

For the author, it proved I wanted to stay home with my family! Shortly after returning to Autonetics, I was transferred to the new Minuteman Proposal and Engineering Group. I worked on the Minuteman Systems for the next 28 years, retiring in 1986.

About the Author: Roger joined Autonetics in 1955 as a Research Electronic Technician after having served in the U.S. Air Force as a guidance system technician. His pursuit of a degree in night school at Long Beach City College was interrupted by the North Pole voyage. He advanced through several projects including the N2C, N5A/B, N6A, NS10, NS17, NS20 Inertial Navigation Systems and the NATDAN, Quaint, D37 Computers. His career spanned the MINUTEMAN I, II and III Programs. He retired in 1986 as a Project Engineer and currently resides in Ogden, Utah with his lovely wife of 60 years, June. All photos are from the Schmidt Collection.

The Many Faces of North American Aviation

by Mike and Rebecca Aguilar

Editor's Note: Over the short span of its history, the many successes of North American Aviation relied on the thousands of employees that provided that added impetus of courage, wisdom, determination and sacrifice. Not all were recognized with awards and promotions but all contributed. The Bulletin is embarking on a new series of articles about the people that made up the North American Aviation family. We are fortunate that we begin with a couple that started at NAA, worked at NAA, met at NAA, and married at NAA.

Between them, Mike Aguilar and his wife, Rebecca Jaurequi Aguilar, worked at North American Aviation (NAA)/Rockwell/Boeing for over 75 years. They each started at an early age, began at entry-level positions for students, rose to management responsibilities, were part of the evolution of work-related technology over the last 50 years, and supported many of the company's key space programs.

Mike began at NAA at age 21 in 1963 while going to college, and retired in 2001 as Business Development Director at Boeing Satellite Systems. He continues to support the aerospace industry, including Boeing, as a consultant providing proposal development services. Rebecca started at 18 right out of high school in 1973, and retired in 2011 as Manager Protocol Services and Field Marketing Support. Here are some of their reminiscences of working at Downey, Seal Beach, and Anaheim where they spent their careers, met, worked together as colleagues, became friends, and married.

Mike begins, *"I grew up in the 40s in Los Angeles with Hopalong Cassidy and Flash Gordon as my heroes. When I was trying to figure out what I wanted to be when I grew up more, it didn't seem practical to become a cowboy, but I thought someday I could be a space cadet. In the early 60s, I started going to college at California Polytechnic State University in Pomona, and needed a job to pay my way. I knew that a few years earlier this company in Downey, North American Aviation, had won the contract to design and build the Apollo Command and Service Modules to go to the moon, so I ran down there to ask if they needed help. It turns out that they were hiring anybody who knew how to use a slide rule or drafting machine, and, as an engineering major at Cal Poly, I could do both. I got a job on the spot.*



"The job was," Mike continues, *"incorporating Engineering change Orders (EOs) on drawings for the Apollo Command Module on second shift after school as part of the NAA Engineering College Unit Program. This program included about 100 college students working at NAA part time while going to school. This College Unit program enabled the company to get relatively low cost technical support for its programs (I think I started at $1.25 an hour) and train potential future engineers in NAA practices and tools. The program helped students gain income and work experience.*

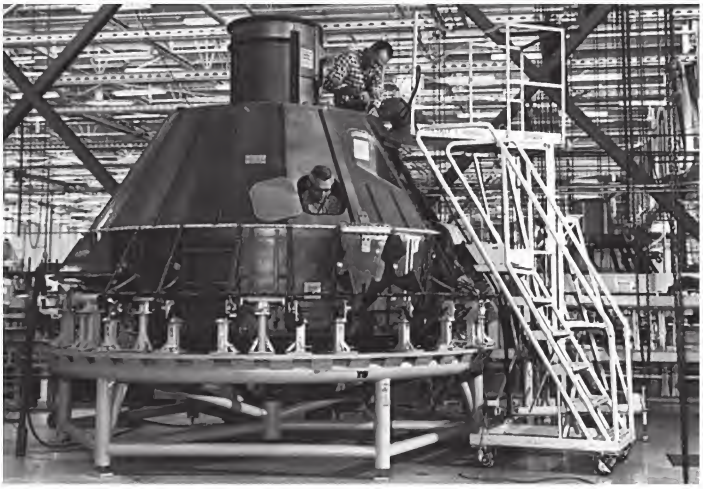
"I was one of the most junior of the forty thousand plus people working at Downey at the time, and ended up spending about 38 years with NAA and its successor companies working on many internal and contract projects, but, as I approach my 50th year of being in the aerospace business, I look back on those days in Building 1 off Lakewood Boulevard working on the Apollo Program as among the most significant and memorable of my career."

Mike further recalls the early years working on Apollo: *"Designing the Apollo moon mission hardware was quite different then than it would be today. There were no desktop computers for calculations or drawings. I used a drafting machine to make drawings, and my slide rule and mechanical calculators for computations. My cell phone today has more computational power than the computer aboard the Apollo Command Module, and Computer Aided Design (CAD) software has made drafting machines antiques.*

"Besides the technical tools," Mike continues, *"the work environment was also quite different. We all wore ties with our white shirts to the office, worked in very large bays with row after row of desks and drafting tables, and were very serious as we went about our jobs. We were going to the moon before this decade was over and had to beat the Russians doing it. There was a sense of urgency in what we all worked on; a lot had to be accomplished in a very short amount of time. Like I said, I was a small part of the enterprise, but I took it quite seriously, and like everybody else on the program, had a lot of pride and self satisfaction for being part of the grand adventure.*

"The Downey plant went through a lot of expansion in the early Sixties to accommodate the buildup of the program and hardware. I remember taking a shuttle bus around the plant going to different buildings. I worked in a temporary trailer for a while. The facility was still full of people at night, with many others besides me working second shift.





"I worked on Apollo from 1963 to 1965, and took a military leave of absence from 1965 to 1967 to serve aboard a Navy destroyer escort patrolling the coast of Vietnam to interdict contraband going from North to South. While onboard, I did my best to keep up with events back home, especially the progress on Apollo, but current news was hard to come by.

"I was deeply shocked and saddened when I heard about the fire in the Apollo I Command Module in January of 1967. In retrospect, the mistakes in design, production, and management made by NAA and NASA that led to the disaster were likely a consequence of the extremely aggressive schedule the program was working on. When I returned from Navy active duty in June of 1967, I resumed work on the Block II Apollo capsule, and continued with school.

"I graduated in 1969 with a BSEE and was hired on as a full time engineer. Design and production work on Apollo was winding down, so I began working on R&D programs in advanced technology for future space missions. NAA had become North American Rockwell (NAR) and was thinking about new businesses to enter, one of which was space satellites. In the early 70s, I was transferred to Seal Beach to help start up the satellite business. About this time, my future wife, Rebecca, joined the company."

About her introduction to NAR, Rebecca says, *"The beginning of my time in Downey started when I was a sophomore in High School in 1971. At the time, the company had an industry partnership with education called the ACT (Advanced Career Training) program. I was a promising high school student and they had volunteer employees provide classes in subjects and with equipment not readily available in schools. It was a perfect match. I did well in their self-paced program learning to use new office equipment, and they took notice.*

"By the time I graduated from high school, my college plans had taken a different route as my father had suddenly passed away. Now here I was, 18 years old and needed to work full time and go to college part-time. So I pulled out the want-ads and took my big red marker, confidently circling all the positions for which I thought I would be qualified.

"My first interview was a success, and I was offered a job as a receptionist in a small company. I was excited about my good fortune, but quickly let them know that there was 'only one thing wrong.' When they asked what that was, I said, 'I'd like to make more than $1.75 an hour.' *That was minimum wage back in 1973, and here was a high school graduate with little experience asking for more. They asked me to work for them a week and they would see if I was worth more. On Friday I marched back into their office and said,* 'Well?' *and they replied,* 'You're right, how much do you want?' *That is when my real brains kicked in and I asked for 25 cents. I wanted to make $2.00 an hour.*

"They readily agreed and I was a happy girl. I'd like to clarify that I'm now a lot smarter and I've been humbled since then. Two weeks into the job, I received a call from Ed Fausch whose opening line was, 'Come back to work for North American!' *Still elated over my $2.00, I didn't let him explain any of the particulars. I only remember saying,* 'Oh no, Ed, I have a job.' *Thanks to his tenacity, he called back a couple of weeks later and wanted to talk to me about a new project opportunity. I reluctantly agreed to listen. He told me this was a great time to join the company since it was the start of the Space Shuttle program. I would have an exciting job and be a part of history.* 'The Shuttle program will change the world,' *he said. And then he casually mentioned that the starting pay would be $4.86, to which I exclaimed,* 'I'll be right over!'

"I was in the first wave of new hires after a major downsize in the workforce after the Apollo program. I began in the Communications Department as a typist on the magnetic tape Selectric typewriter that I learned to use in the ACT program. It was quite a revolutionary machine back in its day. But I quickly became restless with routine clerical work and began to explore opportunities to do other things. I ended up in a very dynamic and busy department called Management Communications that was anything but routine. I loved it!

"It truly was a part of history. I watched the Shuttle being built piece by piece. I was a part of the planning team for Shuttle launch/landing special events. When Boeing acquired Rockwell's Space and Defense organizations, they created a Space and Communications Headquarters in Seal Beach. I was asked to join the corporate team and be responsible for Customer Relations of various Boeing business units to ensure integrated and consistent presence at industry events. My responsibilities included supporting management, dignitaries, customers, employees and community groups. I served on the Boards of Directors for five customer and industry organizations. I was privileged to work with many company and customer executives, including many astronauts.

"I eventually had the opportunity to lead a great professional team in the organization, and planning of special events for



Rebecca with NAA President Lee Atwood



Rebecca meeting with NASA Astronaut and U.S. Senator John Glenn

domestic, international, government and commercial customers. I managed customer activities for air and trade show support in Amsterdam, Paris, Toulouse, London, Tokyo, Hannover, Madrid, Geneva, Melbourne, Brisbane, Sydney and Singapore. I also supported technical meetings, media tours and other senior-level customer activities that helped position Boeing as a premiere aerospace company."

"It was through her Customer Relations activities," says Mike, *"that Rebecca and I first met, worked together for many years, and eventually got married. I did engineering in advanced technology R&D, became a Program Manager on DOD satellite technology development programs, and ended up in Business Development. One of my responsibilities was to attend trade shows and conferences, representing the company by presenting papers and briefings, and doing booth duty. This was before computer projection, so we used vu-graphs.*



"Rebecca was instrumental in setting up meetings, interfacing with her customer counterparts, and working the logistics behind the scenes at industry events we both supported. We did many other work-related activities, like representing the company at black tie dinners, doing community events such as cleaning up the Bolsa Chica wetlands in Huntington Beach and working on the Boeing Rose Parade Float."

Rebecca continues, *"As I travelled around the world, I realized that appropriate protocol was the key to successful business relationships. I was supporting senior leadership at Boeing, their industry counterparts, customers, members of royal families, and high-ranking military officers. I began to learn as much as I could about doing business in other countries, with the military, and about royal protocol. I took special training and was certified by The Protocol School of Washington, D.C. as a Corporate Etiquette and International Protocol Consultant. My hands-on experience with domestic and international commercial and government customers created the ideal platform for learning. Understanding how important this knowledge base was, I began to teach protocol internally for Boeing and externally for other audiences, which I still do."*



Mike and Rebecca attending the 2009 U.S. Army Ball

Rebecca concludes, *"I spent my 38 years at NAR/Rockwell/ Boeing in Communications, Business Development and Customer Relations and couldn't have asked for a better career. Along the way I earned a B.A. Degree in Communications from California State University, Fullerton. I retired in 2011 as a Manager of Protocol Services and Field Marketing Support where I had the opportunity to manage special projects and events such as Air Force Week, Centennial of Naval Aviation celebration activities and the IMAX Rescue premieres. I have a lot of great memories of the people and projects I worked with, and still keep in touch."*

A Final Editorial Note: We thank Mike and Rebecca for this splendid start on what we hope will become a series of articles. We wish every happiness to this couple residing in Buena Park, California.



Congratulations and Best Wishes to

Dale and Peggy Stinson of Sun City, Arizona
celebrating their 58th Wedding Anniversary

Winston and Pansy Greene of Valencia, California
celebrating their 55th Wedding Anniversary

May you have
Enough happiness to make you sweet,
Enough trials to make you strong,
Enough sorrow to keep you human, and
Enough hope to make you happy.

YOU COULD HAVE HEARD A PIN DROP!

At a time when our President and other politicians tend to apologize and denigrate our Country's prior actions, here is a refresher on how some of our patriots handled negative comments about our Nation in the past.

There was a conference in France where a number of international engineers were taking part, including French and American. During a break, one of the French engineers came back into the room saying, *"Have you heard the latest dumb stunt Bush has done? He sent an aircraft carrier to Indonesia to help the tsunami victims. What does he intend to do, bomb them?"*

A Boeing engineer stood up and replied quietly, *"Our carriers have three hospitals on board that can treat several hundred people; they are nuclear powered and can supply emergency electrical power to shore facilities; they have three cafeterias with the capacity to feed 3,000 people three meals a day; they can produce several thousand gallons of fresh water from sea water each day, and they carry half dozen helicopters for use in transporting victims and injured to and from the flight deck. We have eleven such ships. How many does France have?"*

You Could Have Heard A Pin Drop!

Robert Whiting, an elderly gentleman of 83, arrived in Paris by plane. At French customs, he took a few minutes to locate his passport in his carry on. *"You have been to France before, monsieur?"* the customs officer asked sarcastically. Mr. Whiting admitted that he had been to France previously. *"Then you should know enough to have your passport ready."*

The American said, *"The last time I was here, I didn't have to show it."*

"Impossible! Americans always have to show their passports on arrival in France!"

The American senior gave the Frenchman a long, hard look. Then he quietly explained, *"Well, when I came ashore at Omaha Beach on D-Day in 1944 to help liberate this country, I couldn't find a single Frenchman to show a passport to."*

You Could Have Heard A Pin Drop!

God, I love this Country!

"Politics is supposed to be the second oldest profession. I have come to realize it bears a very close resemblance to the first."

— Ronald Reagan

FROM THE STREETS TO THE STARS

The Story of Hank Dinenno as told in his own words



Growing up in a poor, crime infested community as a hard core juvinile delinquent and gang leader, made Henry Dinenno's parents' dreams for a better future a lost cause. This book describes the life altering events that influenced his transition from this violent beginning to the pursuit of advanced education and finally to increasing technical and management responsibilities on the Apollo and Space Shuttle programs. It provides an insider's perspective on how NASA and North American dealt with successes and failures during the unbelievably exciting launches at the Kennedy Space Center. It culminates when, as Vice President of Advanced Programs and Business Development for the Space Systems Division, he received a special invitation to the Planetary Congress of the Association of Space Explorers where he spent several days with more than 80 astronauts and cosmonauts that were truly the stars of his world.

"From the Streets to the Stars" is available through Amazon (www.amazon.com), Barnes & Noble (www.barnesandnoble.com) and local book stores.



Former NAA KSC Launch Team members met on February 9, 2012 for their monthly luncheon. Standing left to right: Lee Solid, Walt Antoniewski, John Tribe, Conrad Perez, Grabe Harmon, Ed Rogers, Jesse Owens, Wilson Behney, Bill Trudeau, Bill Edson, Joel Robinson, Paul Rupert and Al Seraphine. Kneeling left to right: Carl Robb, Jim Mewborn, Jerry Sheehan, Ed Williamson and Dave Sanders

Contrails From The Past

by Ed Rusinek

Dear Ed,

Sat down this morning with my coffee and pumpkin scones to read the NAA Retiree Bulletin. In short, the Engineer's View reminded me why I, ever so rightly, went to work for Rockwell International almost 30 years ago. Within a few short years, engineers designed and built a reusable manned space vehicle that started over EIGHT presidencies and EIGHTEEN NASA administrators ago. As Larry Korb basically stated, the Orbiter's design was faultless in both accidents. The engineering principles and architecture the Orbiters were built on are as sound today as they were back then. Two things I remember and carry with me are – how redundancy was built into the hardware and the avionics using every methodology possible – from physical location, software, MSIDs spread across the MDMs, electrical, pyro etc. Spreading the MPS/SSME ATVC and engine control across pneumatics, hydraulics and avionics is an incredible design masterpiece. The other is described in both the *Challenger* and *Columbia* accident reports detailing the last seconds of flight from a command and control standpoint. Both Orbiters tried – as if human – to save themselves. Not one command sent contributed to the end result. This is a tribute to the engineers who – in my mind – created life, not the politicians and NASA public affairs people, who starved the budget and created unrealistic expectations.

— Gregory Koch, Oviedo, FL

Ed's Ans.: Wow! Greg, I couldn't have said it better! You and Larry would have made a couple of good lawyers for North American Aviation. Perhaps, we would still have been NAA.

Dear Ed,

My Dad was F. W. Schmitt. He worked for Berliner-Joyce which became General Aviation and then North American Aviation. We lived in Baltimore, Maryland. One day in 1935, he came home and told us that we were moving to California. The movers came and packed our furniture. We had no car so a friend of my Dad's, Dutch Kindelberger, loaned us his Buick to make the trip. I was 9 at the time and I watched NAA grow into the best aviation firm ever!

— Bill Schmitt, Chatsworth, CA

Ed's Ans.: Your story was too good to pass up, Bill, so we called you and you came through for us in this issue!

Dear Ed,

I retired from the Columbus Division in about 1968 after some 13 years of service. I am 91.

— Jim Haywood, Franklin, TN

Ed's Ans: We are always happy to hear from our 91 years young readers. Hang in there and let's hear from you at 92!

Dear Ed,

Enclosed is my check for 2012. At my age, 96, I only plan a year at a time. Still going strong and got my license renewed for 5 more years. I really enjoy the Bulletin and didn't realize that the company had so much talent. But, after all, I was just a bean counter.

— Walter Christianson, Auburn, CA

Ed's Ans.: Nobody at North American Aviation was ever a "just". If you were a bean counter, you were the best damned bean counter around!

Dear Ed,

Larry Korb's article in the Winter Issue was right on with his "fire back" to former NASA Administrator Michael Griffin!

— Alex McCool, Huntsville, AL

Ed's Ans: Some folks think it's safe to lambast North American Aviation because the company disappeared fifty years ago. Well, Hello! There still are some NAA types around that are full of P & V and armed with the facts!

Dear Ed,

Larry Korb's Shuttle article in the last issue was outstanding!

— Lee Solid, Merritt Island, FL

Ed's Ans.: Same as above!

Dear Ed,

I want to salute Larry Korb and to inform him of someone else of considerable power is in his corner. I am reading a book entitled *"GABBY"*, written by Gabrielle Giffords and Mark Kelly, the commander of STS-134 and former NASA astronaut. In Chapter 10, titled *"The Ace of Spades"*, he writes these words, *"Like the* Challenger *accident seventeen years earlier, the loss of* Columbia *came in the wake of signs that were ignored. This wasn't just a random accident. NASA certainly could have done a better job of addressing the long-term problem of foam liberating from the external tank. While the space shuttle is an incredible complex machine that can fail in thousands of catastrophic ways, it sometimes tries to tell you ahead of time what is coming. I think this was one of those times. We had seem foam problems again and again on successive launches and done little about it. Poor decision-making contributed to both tragedies,* Challenger *and* Columbia.*"*

This comes from a well respected astronaut and is published in a book that might, just might, be read by the general public, rather than hidden in some investigative report and filed away. That being said, you might feel moved to publish this letter. Thank you.

— Russel Munroe, Orange, CA

Ed's Ans.: Damned straight! We will publish your letter and we thank you for bringing the information in Mr. Kelly's book to our attention.

Dear Ed,

Let me add to the voice of many that YOU make the BULLETIN what it is – GREAT! I would be honored to sit at your table at the 50th Bald Eagles Reunion, thanks Old Friend!

— Pete Magoski, Buena Park, CA

Ed's Ans: We go back over 50 years, Pete. The honor is all mine. I look forward to breaking bread with you.

Dear Ed,

Thank you for including me in your distribution of the latest issue of the NAA Retirees Bulletin. The story by Larry Korb on the Space Shuttle Challenge was riveting and answered some questions about the Shuttle's development that I thought would forever remain a mystery. It is clear that the "Greatest Generation" of Aerospace had its roots somewhere near Seal Beach. My hat's off to the men and women who built that fantastic vehicle and I am proud to include myself amongst the few who had the distinct privilege to fly one.

— Chris Ferguson, Houston TX
(Captain Christopher Ferguson, STS-135 Commander)

Ed's Ans.: Thank you for your kind words. Our roots started at the Los Angeles Division, moved on to Downey-Space Division, Autonetics, Rocketyne, Atomics International, Edwards AFB, JSC, KSC and dozens of other satellite stations. The people were outstanding and created inventions on a schedule!

Life isn't about waiting for the storm to pass…

It's about learning to dance in the rain!

The Pleasure of Your Company Is Requested at the 50th Golden Anniversary Bald Eagles Reunion to be held on Saturday, April 28, 2012 at the Proud Bird Restaurant
11022 Aviation Blvd. (at 111th Street)
Los Angeles, CA



Attendance Cost: $33.00 with Advance Reservation
$35.00 at the Door – Name Badges and Meal Tickets Given at Door

Doors Open for Social at 10:00 A.M. Seating for Luncheon at 12:00 Noon

The Honorary Speaker will be James Albaugh, Executive Vice President of The Boeing Company and President and Chief Executive Officer, Commercial Airplanes. He will be providing an overview of the Boeing 787 "Dreamliner".

Our special guest will be Martin "Buzz" Holland of the original 50 families that made the journey from Dundalk to Inglewood.

The meal choices are Prime Rib, Chicken or Vegetarian. Please indicate your choice on your check. Please make your checks payable to the Bald Eagles, Inc. and send them to:

Cathy Baker
Bald Eagles, Inc.
16372 Lakemont Lane
Huntington Beach, CA 92674

Phone: (714) 847-1678

Want to sit with your friends? Organize a group of eight and order tickets in one batch!
Have no friends? Come anyway and make new friends!

The Silent Majority

by Stan Guzy



ASTRONAUT JANICE VOSS, 55 – a veteran of five spaceflights and a former science director for a NASA exoplanet-hunting spacecraft, Janice passed away on February 6, 2012 of cancer. Her first mission, STS-57, aboard Endeavor, included biomedical and material science experiments in the pressurized Spacehab module mounted in the payload bay. Other flights included two rendezvous missions with the Russian Mir space station and a complete digital topographic map of the Earth mission. In total, Janice logged over 49 days in Space, traveling 18.8 million miles circling the Earth 779 times. She received her doctorate degree in aeronautics and astronautics from MIT.

RAIKLIN, HAROLD "HAL", 91 – passed away on January 3, 2012 in Long Beach, CA. After serving six years in the USAF, he earned his B.S. and M.S. degree in Mechanical Engineering at MIT. Joining NAA, his technical leadership extends to the B-45, F-86, F-100, XB-70 and B-1 aircraft and the Saturn S-II Booster. Retiring from NAA/RI in 1982 after 33 years, he had served as Vice President of Engineering and Research, North American Aircraft Operations and as Vice President Space Division and Program Manager/President Saturn S-II/Apollo. In 1976, he was the recipient of the prestigious Robert J. Collier Trophy in recognition of his magnificent work on the B-1.

ALPERT, ROBERT A. "BOB", 83 – of Henderson, NV, collapsed at an IBM seminar on October 26, 2011 at the Mandalay Bay Hotel and passed away in the hospital of cardiac arrest. Bob had served in the Korean conflict and retired from Space Division in 1990 with 28 years of service on the Apollo and Model Cities programs. He had celebrated his 60th Wedding Anniversary on August 19th with his loving wife, Mildred.

ANDERSON, BEVERLY A., 80 – passed away in the hospital in Henderson, NV on November 17, 2011 after colon surgery. Serving at Autonetics and Seal Beach, Beverly was one of the fastest typists in the Company, often completing the assignment before the submitter returned to his desk. Retiring after 30 years of service, she loved the nickel machines and bingo games at the Las Vegas casinos. Good Night Beverly!

BAKER, PATRICIA J., – of Hawaiian Gardens, CA, passed away peacefully on December 1, 2011 just two months after being diagnosed with cancer. Pat had a lifelong career as a secretary in Downey, retiring in 1996 with 34 years of service. She was always a generous person and a fun loving spirit.

BOWMAN, ROBERT L. "BOB", 77 – died in Anaheim, CA on January 18, 2012. After serving with the 3rd Marine Division, Bob came to Space Division in 1960 and worked in the Clean Room as a tube brazer for fluid systems on the Apollo and Shuttle programs.

ETZEL, CHARLES W. "CHUCK", 80 – passed away on September 13, 2011 at home in Hays, KS. Chuck joined NAA in 1951 and advanced from the Machine Shop through Lofting to Design. He worked on the B-70, Apollo/Saturn and B-1 programs and retired from Space Shuttle GSE in 1986 as a Design Engineer with 35 years of service. He is survived by his loving wife, Bettye, who is also an NAA/RI retiree with 29 years of service.

GEJER, JOHN H., 92 – passed away peacefully in his home in Hawthorne, CA on December 8, 2011. John came to LAD in March 1942. In April 1943 he joined the U.S. Navy and served aboard the destroyer *USS Hunt* in the South Pacific. At the end of hostilities, he returned to NAA and served for 35 years until retiring from Rocketdyne in 1977. He was a Life Member of the Death Valley '49ers. John is survived by the love of his life of 70 years, Margaret.

GOSS, JOSEPH R., 82 – of Huntington Beach, CA passed away following heart valve surgery. Joe served in Korea in 1951 and earned a B.S. in Engineering from USC in 1959. While at USC, he worked summers at Rocketdyne on the J-2 Rocket Engine and advanced with growing responsibilities at LAD. He was a B-1 Proposal Manager and upon contract award became a Vice President. He retired in 1996 and is survived by his loving wife of 57 years, Janice.

HENRY, ROBERT "BOB", 81 – of Prescott, AZ died in his sleep on January 17, 2012. Bob had 25 years of service on the Saturn II and Space Shuttle projects at Space Division when he retired in 1989. He was responsible for the Shuttle Main Propulsion Liquid H_2 and O_2 feed lines. Bob is survived by his loving wife, Dorothy.

LEVY, WILLIAM J. "BILL", 78 – died of lung cancer at his home in Orange, CA on December 15, 2011. He retired in 1990 after 29 years of service with NAA/RI Defense Electronics in Anaheim, CA. He had been very

active with the Orange Rotary Club and traveled extensively with his loving wife of 49 years, Ruth.

LLORENTE, DAVID, 82 – died on January 12, 2012 in Webster, TX following an extensive illness. David spent his childhood in the Philippines, attended grade school in Japan and high school in Carmel, CA. After serving in the U.S. Army Air Corps, he graduated from Northrop Institute and joined NAA as a Technical Representative. He later transferred to Space Division in Downey and moved on to NASA/JSC and NASA/KSC. He was named Director of Quality and Reliability for NAA/RI on the STSOC program, retiring with 35 years of service. He is survived by his caring wife, Anita Darlene.

MASSEY, DALE L., 73 – passed away peacefully on November 17, 2011 after a year-long battle with cancer. Dale retired after 30 years of service to enjoy her passions – family, traveling and cooking.

PIZULA, NICKOLAS "STEVE", 87 – died on December 10, 2011. Steve served proudly in the USMC during World War II and worked for many years as a computer operator at NAA/RI. He had a passion for golf and will be missed by his family and friends.

PROCTOR, EDWARD G. "JERRY", 81 – passed away on February 24, 2011 at his home in Sequim, WA with his wife and daughter at his side. Jerry retired in 1990 from LAD with 30 years of service. He was an avid golfer and enjoyed his days on the links. He is survived by his loving wife, Hazel.

ROBERSON, WILLIAM E., 82 – passed away on November 18, 2011 of Lou Gehrig disease. He lived in the South Bay area of Gardena, CA for 59 years. He retired from LAD in 1984 with 31 years of service as a welder on several programs including the B-1. He is survived by his wife of 37 years, Bernice.

SCHUETZ, PHILLIP H., 76 – of Buena Park, CA died on January 22, 2012. Phil retired in 1997 from Space Division where he served in Structural Dynamics conducting vibration and acoustic tests on Apollo and Space Shuttle structures. He is survived by his wife, Helen.

SEARS, ROBERT E., JR., 80 – passed away on December 24, 2011 from a non-malignant Meningioma Tumor of the Frontal Lobe which was diagnosed in 1993. Bob joined NAA Columbus in the late 1950s, transferred to NAA Cape Canaveral in the 1960s, came to NAA Downey and NAA Palmdale in the 1980s and, finally, retired from NAA/RI at Vandenberg AFB in 1990 with 35 years of service. He is survived by his loving wife of 50 years, Dolores.

ZUCKER, HERBERT W., 83 – passed away on January 1, 2012. After service in Korea, Herb joined NAA in 1953 and retired with over 37 years of service. He is survived by his wife of 51 years, Thelma.

LOST SHEEP, BULLETIN RETURNED WITH NO FORWARDING ADDRESS

THOMAS W. MILLER – WESTMINSTER, CA

P. A. PETERSON – TORRANCE, CA

SOLOMON H. PLEASANT, JR. – RIO VERDE, AZ



PAX DOMINI SIT SEMPER VOBISCUM

"When I stand before God at the end of my life, I would hope that I would not have a single bit of talent left, and could say, 'I used everything you gave me.'"

— Erma Bombeck

NORTH AMERICAN AVIATION
RETIREES BULLETIN
P.O. Box 3797
Seal Beach, CA 90740

North American Aviation Retirees Bulletin
"Where The Best Never Rest"

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Photo from the Boeing NAA History Files

***As Chief Engineer of the Douglas Aircraft Corporation, Dutch Kindelberger poses with his new 1929 Oldsmobile in front of a Douglas C-1 Cargo plane. Two C-1s were used as "tankers" in the 1929 record endurance flight of the U.S. Army Air Service Fokker C-2* "Question Mark".**

NORTH AMERICAN AVIATION
Retirees Bulletin
"Where The Best Never Rest"

Summer 2012

RECIPIENTS OF THE NORTH AMERICAN AVIATION 2012 OUTSTANDING ACHIEVEMENT AWARDS



Cadet Dustin C. Woodside
Excellence in Aerodynamics

Cadet Caleb W. Whitlock
Excellence in Astronautics

Cadet Cody O. Deacon
Excellence in Basic Research

Cadet Mark W. Boyer
Excellence in Basic Research

Cadet Candidate Alejandro C. Hardaway
Excellence in the U.S. Air Force Academy Preparatory School

NORTH AMERICAN AVIATION
Retirees Bulletin

North American Aviation Retirees Bulletin, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

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North American Aviation Retirees Bulletin
P. O. Box 3797
Seal Beach, CA 90740

NAA RETIREES BULLETIN VOLUNTEERS
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Dear NAA Retirees Bulletin Subscriber

Our **50th GOLDEN ANNIVERSARY BALD EAGLES REUNION** was held on Saturday, April 28, 2012 at the Proud Bird Restaurant. The speaker was James Albaugh, Executive Vice President of the Boeing Company and President and Chief Executive, Commercial Airplanes. He gave a short but informative speech about the progress being made by the Commercial Airplanes Division of Boeing. Since he is well remembered from his time with NAA/Rockwell, it was informal and much like a family member coming home and reporting on his latest experiences. To add to the 50th Anniversary of the Bald Eagles; Martin "Buzz" Holland, the last survivor of the original Dundalk group that made the long trek across the nation, arrived and was warmly greeted. Lastly, the celebration of this milestone was totally awesome thanks to the outstanding work done by Cathy Baker, Sharon Simonsen and Sharon's daughter, Shanon Self. Upon checking in, each of the 332 guests received a gift package consisting of a B-1 DVD and a souvenir crystal weight with the assigned table designated and the meal ticket. The tables were beautifully decorated with flower centerpieces and enough 50th Anniversary baseball caps for all at the table. Each seat had a beautiful souvenir name tag created by Ray Operacz. From all who attended, thank you ladies and Ray for a beautiful celebration. Also, thanks to Boeing for financing the 50th Anniversary caps and souvenirs. That was a very kind gesture.

For the third year, North American Aviation was well represented at the United States Air Force Academy. In April, Bob Hindy of Rocketdyne, visited the campus and spoke to the faculty of the Aeronautics and Astronautics Departments in an informal joint "brown bag" meeting. He addressed the Cadets of both departments and the Systems Engineering program and an evening session with the local AIAA at the University of Colorado, Colorado Springs. His subject was *Development of High Energy Laser Airborne Weapon Systems.* In May, we asked our good friend Lt. Col. John Swanson, U.S. Army Reserve to represent us at the United States Air Force Academy Preparatory School graduation and Stan Barauskas to present the North American Aviation Outstanding Achievement Awards at the Aeronautics and Astronautics graduation ceremonies. How can we possibly thank these gentlemen for representing our company and all of us in such a noble and generous act of service? All volunteered in the spirit of NAA. We may be only the vicissitude of the greatest aerospace company that ever existed but we will be damned if we shall go out quietly into the night!

By a strange coincidence we have three P-51 articles in this issue. Our latest author was a P-51 Mustang pilot serving with the USAAF 352nd Fighter Group, known begrudgingly to the Luftwaffe as the *"Bluenosed Bastards of Bodney"*. His name is Robert H. "Punchy" Powell. He writes of his closest call when his aircraft bursts into flames on takeoff.

For our second article, our popular Lowell Ford returns with the chilling story of the 8th Air Force being savaged by the German latest bomber killer—the Me 262—with horrendous loss of B-17s and turning to NAA for a quick solution. The response is a rocket powered P-51.

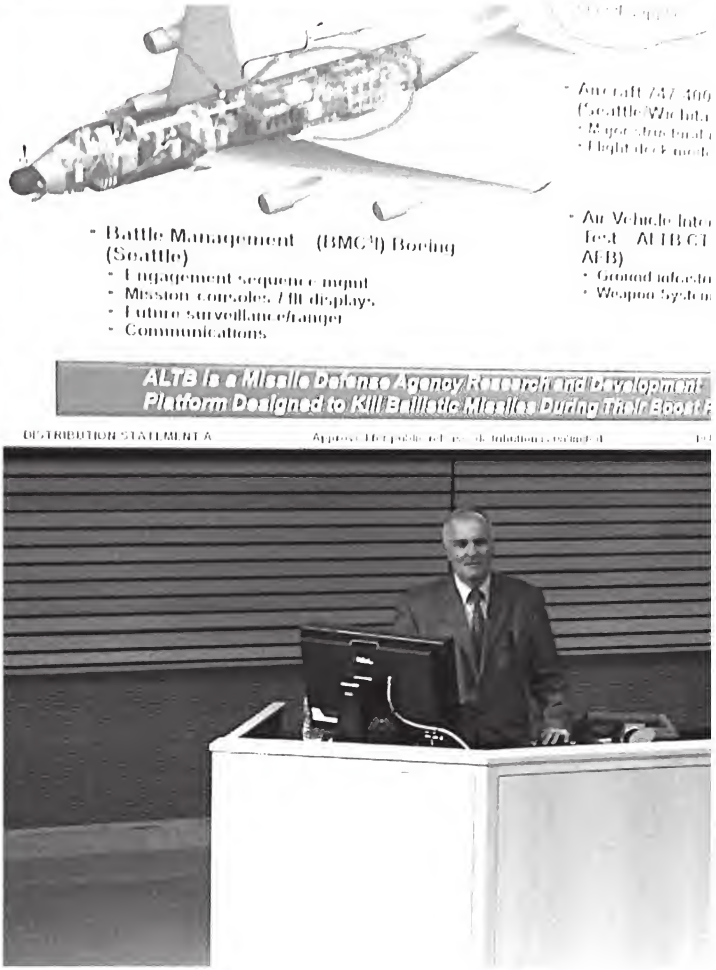
The third article is from our aviation history author, Dave Stern, telling of the difficulties that were encountered in keeping the P-51 Mustang operational in the freezing environment of Alaska. The pilots and ground crews were constantly challenged to keep the aircraft functioning. — Ed Rusinek

Robert Hindy Gives Presentations at the U.S. Air Force Academy In April

As a result of the NAA award program endowed by the NAA Retirees Bulletin, Robert Hindy of Rocketdyne was the second NAA speaker invited jointly by the Astronautical and Aeronautical Engineering Departments to the U.S. Air Force Academy for a three day visit, April 10-12, to give his presentation *"Development of High Energy Laser Airborne Systems"*. He gave his briefing to the first-class cadets of both departments and the Systems Engineering Department. His talk was based on the extensive work he had done with the original Airborne Laser Laboratory while in the U.S. Air Force and the 747 Airborne Laser Program at Rocketdyne. Robert was also invited to an informal "brown bag" session with the faculties of the schools and an evening presentation with the Colorado Springs/Denver professional engineering chapters and the UCCS faculty/students. Thank you Robert, you did us proud!







North American Aviation Outstanding Cadet Recognition Awards

Photos courtesy of Lt. Col. Scott Nowlin, USAF, Capt. Donald Heaton, USAF and Mr. Mark Winter

For the third year running, the North American Aviation Outstanding Cadet Recognition Awards were presented to three United States Air Force Academy graduating cadets in the Department of Aeronautics, one in the Department of Astronautics and a Cadet Candidate in the U.S. Air Force Academy Preparatory School. These awards were sponsored and endowed by the North American Aviation Retirees Bulletin to be presented each year into perpetuity. In recognizing these outperforming and motivated individuals, we wish to associate the very best in the future with the name North American Aviation, the company that always provided the very best in defense of this Nation. We are grateful for this splendid opportunity to be associated with our young men and women who have volunteered to serve and defend our great Republic. God Bless them all!



Stan Barauskas presents the NAA Outstanding Achievement Award to Cadet First Class Dustin C. Woodside from Columbus, Nebraska, the Outstanding Cadet in Aerodynamics.



Stan Barauskas presents the NAA Award for Excellence in Basic Research to Cadet First Class Cody O. Deacon from Portland, Oregon and to Cadet First Class Mark W. Boyer from Hershey, Pennsylvania.



Stan Barauskas presents the NAA Outstanding Achievement Award for Astronautics to Cadet First Class Caleb W. Whitlock while being assisted by Colonel Martin France, Astronautics Department Head.



The Outstanding Cadet Candidate at the U.S. Air Force Academy Preparatory School, Alejandro C. Hardaway of Hazel Crest, Illinois, received the NAA Recognition Award from Lt. Colonel John Swanson, U.S. Army Reserve. A good friend of the NAA Retirees Bulletin, John was pleased to again represent NAA at this proud function.

"It's that simple yet revolutionary idea that was at our founding and in our hearts ever since: that we have it in our power to make the world anew, to make the future what we will …It's that fundamental faith: that American optimism, which says that no challenge is too great, no mission too hard. It's the spirit that guides your class: 'Never Falter, Never Fail.' ...With your proud service, I am absolutely confident that America will meet the challenges of our time."

— President Barack Obama
United States Air Force Academy
Class of 2012 Graduation Address

Ed,

The three days I spent at the Air Force Academy participating in the North American Aviation Awards for outstanding cadets and then attending their graduation the following day were very rewarding and inspiring. I was extremely impressed with the young men who received awards for their excellent academic performance in Basic Research, Astronautics and Aerodynamics. They stand ready to make a significant contribution to our nation's defense and improve the lives of all U.S. citizens. It was a great honor to be able to recognize these young cadets for their accomplishments and witness their graduation and entry into the U.S. Air Force as Second Lieutenants. They are a fine example for others to follow and our Air Force is truly enhanced by their joining its ranks.

The day before the awards ceremonies, I was given a tour by Lt. Col. Scott Nowlin of some of the facilities and laboratories at the Academy. They were state of the art and are heavily relied upon for demonstrating and investigating new aircraft and spacecraft design concepts. Later that evening I was treated to a fine dinner at a local restaurant accompanied by Lt. Col. Nowlin and a few of the teaching staff.

The next day I was met by Capt. Don Heaton, who with Lt. Col. Nowlin, attended ceremonies in Stillman Field. The activities included a glider acrobatic demonstration, a skydiving exhibition, an intricate swordsmanship demonstration and even an appearance by the Academy's trained mascot Falcon. The formal "hand-over of the golden saber" ceremony from the Class of 2012 to the Class of 2013 ended the program.

On the final day of my stay I was invited by Lt. Col. Nowlin to attend the impressive graduation ceremonies on the football field. The honored guest speaker, President Barack Obama, gave a stirring speech congratulating and welcoming the new graduates to a strong and well-equipped, best Air Force in the world. The President saluted, shook hands and personally handed each of the 1,073 graduates their diplomas. At the conclusion of the ceremonies the Thunderbirds flew their F-16 aircraft in heart-pounding, highly precise acrobatic maneuvers. It was a remarkable demonstration of highly skilled and well-choreographed flying.

It was an incredible experience and indeed a great honor to represent the NAA retirees at this year's Air Force Academy's graduation ceremonies.

— Stan B.

My Closest Call!

by Robert H. "Punchy" Powell, Jr., Captain, USAF

In April 1944, I was one of forty-eight P-51 Mustang pilots of the USAAF 352nd Fighter Group, known by the Luftwaffe as the *"Bluenosed Bastards of Bodney"* taking off on a mission to escort B-17s attacking targets in Germany.

Since our airfield consisted of a large grass field with no runways, we always took off in flights of four by squadrons allowing us to get the Group airborne and heading for Germany with a minimum expenditure of fuel to assemble. We actually could get all forty-eight Mustangs into the air in tight formation heading for Germany in just 3-1/2 minutes. When the leading flight started rolling, the following flights started pushing their throttles forward.

On this mission, however, all did no go well for me. I was flying in the White 3 position and we had only reached about 300 feet in altitude when my engine suddenly quit and my plane burst into flames. I was already wheels-up when this happened and nearing the end of the airfield, on fire, heading into some trees bordering the field and with nowhere to go but down. Breaking the old rule of "crash straight ahead", I turned slightly to miss the trees in front of me and felt my plane beginning to stall, I leveled it off just seconds before I hit the ground.

Fortunately, the farmer's field on the other side of the trees just off our base, had been plowed the day before and as my plane scooted along on its belly in the best landing I ever made, the freshly plowed up dirt knocked the flames down long enough for me to scramble out of the cockpit when it stopped and run away from the burning ship. Unknowingly, that farmer had saved my life.

I think I was only about 30 yards from the burning plane when the 86-gallon tank behind my seat exploded, blowing that section of the aircraft away. As General Jimmy Doolittle's book title says, *"I Could Never Be So Lucky Again."*

Having run into the woods near the crash landing, I discovered that was not far from our 328th Squadron Pilots' building, so I walked back there. As I came through the door, Captain Dave Lee, our S-2 officer, was on the field phone reporting my crash. I heard him say, *"I think it was Punchy and it looks like he's had it. He was going into the trees on fire!"* He turned and saw me coming in and quickly said on the phone, *"No, he's OK! He just walked in here."*

Dave and I were close friends and after a moment we got into his jeep and drove back to the scene of the crash. The fire trucks had extinguished the flames and those who had gotten to the scene were looking for my body. These included our Flight Surgeon, Dr. Kenneth Lemon. Feeling pretty cocky at this point I yelled to him, *"Hey, Doc! Who was it?"* He



Photo courtesy of Sam Sox, Jr.

A proud Bluenosed Bastard of Bodney, Lt. Robert H. "Punchy" Powell, Jr. poses on the wing of his P-51B Mustang named* "The West 'by Gawd' Virginian" *prior to takeoff to escort B-17s over Germany.

answered, *"It was Punchy!"* Then, realizing who had called to him, he asked, *"How in the Hell did you get out of that thing?"* It was a joyful moment, knowing I had escaped a fiery death. Today, when asked about this crash, I have always known that God had his hand on the stick with me. I thought I was good, but I knew I was not good enough to have made that landing alone.

Two days later, after Doc Lemon had checked me over, and adhering to that old cowboy adage that says, "Get back on the horse that throws you", I flew my next combat mission in a new P-51D that was to become another *"West 'by Gawd' Virginian."* One of my fellow pilots accused me of crashing my old Mustang on purpose so I could get a D-model. Actually, except for the additional firepower and the better visibility in the newer model, I missed my old bird. We had known each other for more than a year.

I only got to fly my new Mustang on my last eight missions before finishing my second tour with a total of 87 combat missions and qualifying to be returned to the States for reassignment. Looking back, I was truly blessed to have flown in one of the most highly decorated fighter groups of WWII. The 352nd FG destroyed 776 German aircraft and had 29 Aces including Major George E. Preddy, the leading Mustang ace of WWII and Colonel John C. Meyer. Major Preddy was killed on Christmas Day 1944 by friendly fire. He had just destroyed two Me 109s and was chasing a third at treetop level when an American anti-aircraft unit, alerted that enemy aircraft was approaching, shot at both planes and downed Major Preddy. At the time he had scored 26.8 aerial victories and was the leading ace in Europe. Colonel Meyer, our Deputy Commander, later a four-star General and Vice Chief of Staff of the USAF, was close behind him with 24 aerial victories. Colonel Meyer also shot down a MiG-15 during the Korean War while flying a North American F-86 Sabre jet.

I arrived back home on Christmas Eve 1944 and got married ten days later. Betty and I recently celebrated our 67th anniversary. My Mother always said, *"It is better to be lucky than good-looking."*

My Crew Chief, Bob Lyons, rescued the noseart of my *"West 'by Gawd' Virginian"* and cut the burned off *"Virginian"* part of the panel so that I could get it into my footlocker and bring it home as a souvenir. It now hangs on the wall in my recreation room, a reminder of that colorful experience.

About the author: A native of West Virginia, Robert "Punchy" Powell was attending West Virginia University and joined the USAAF immediately after the attack on Pearl Harbor. Commissioned as a Pilot Officer, he was shipped overseas and assigned to the 328th Squadron of the 352nd FG stationed at Bodney, England. Victory credits include six destroyed in the air and ground and two probables in the air and ground. Recalled in 1950, Bob served four more years as a test pilot and public relations officer. Military awards include the Air Medal with three Oak Leaf Clusters and the Distinguished Flying Cross with two Oak Leaf Clusters. Separated from the USAF in 1954, Bob was an Advertising Manager for the Norfolk and Western Railway and Regional Manager for a major publishing house. The sobriquet "Punchy" *was bestowed on him in high school the year he won the West Virginia Golden Glove championship in the flyweight division. Bob currently resides in Atlanta, Georgia with his charming wife Betty.*



Photo courtesy of Sam Sox, Jr.

Remnants of Punchy Powell's P-51B* "West 'by Gawd' Virginian" *after the crash landing and gas tank explosion.

The Flash Performance P-51

by Lowell F. Ford

On March 18, 1945 a flight of thirty-seven German Me 262s of JG 7 intercepted a bomber stream consisting of 1,221 bombers and 632 fighter escorts headed for targets in Germany. Twelve bombers and one fighter were shot down, giving the new swept wing German jet a kill ratio of 12 to one. This action, along with the introduction of the rocket powered Me 163 interceptor sent shivers up the spines at Allied Command and fostered an immediate call for action to counter the threat posed by Germany's new fighter. As described by bomber escort pilots, the new twin-engine jets were going through the bomber formations like "a dose of salts" with near impunity. The situation of having jet aircraft screaming through the bomber formations at will presented an immediate demoralizing agent for the bomber crews and the escorting fighters.

Out of the panic, which followed feedback from the European Theater, an order was flowed down faster than usual to North American Aviation to find an effective countermeasure to the German jet crisis and do so within thirty days. As with other Southern California aviation industries, NAA had close ties with the California Technical Institute in Pasadena. This marvelous think tank had a spin-off organization, known as Aerojet, which had been founded by Dr. Theodore von Karman in 1942. Aerojet had been working with technology gained from Dr. Robert Goddard, also known as the Father of Modern Rocketry. NAA's Engineering Department posed the problem to the folks at Aerojet and the challenge was taken up in earnest to put a rocket motor in the cooling air exit of a P-51 Mustang. As a result of this cooperative effort, P-51D-30 NA-122, S/N 44-73099 was designated as the test article for the rocket installation and was removed from the assembly line for this purpose.

The technicians from Aerojet soon arrived at the plant with their rocket motor, which consisted of a steel combustion chamber fed by two liquid fuel spray nozzles and an exhaust nozzle. This assembly weighed between 40 and 60 pounds. The fuel used in this arrangement was highly caustic, consisting of fuming nitric acid and aniline, stored separately in two 75-gallon underwing fuel tanks, which were pressurized to 1,000 psi. The fuel was fed to the engine through tube lines, controlled by solenoid valves, and self ignited when mixed in the combustion chamber producing 1,320 pounds of thrust.

Following ground testing, NAA test pilot Robert C. Chilton took the first rocket powered Mustang into the air for flight testing on April 23, 1945. The chase/photo plane was piloted by Joe Barton. As the two planes climbed through 18,000 ft to the test altitude of 21,000 ft, Chilton attempted to switch to high blower and found that the switch was defective and returning to low blower when released. Not wanting to abort the test, Chilton improvised a fix to this by releasing the controls and bending down to get a shoelace to tie the blower into high position. Meanwhile, the airplane was flying an "all over the sky" pattern and Barton was standing clear, noting that the pilot was no longer visible in the cockpit. Soon, Chilton reappeared and the flight resumed to test altitude with the blower switch securely laced up.

Once at test altitude, Chilton stabilized air speed at 429 mph and signaled Barton to start the camera rolling. The rocket engine "Start" switch was pushed and the pilot experienced a terrific acceleration for 15 to 20 seconds, then 30 seconds of sustained



Photo from the Lowell Ford Collection

The test airplane, P-51D S/N 44-73099 undergoes static test firing of the two-component propellant rocket motor.



Photo from the Lowell Ford Collection

Test Pilot Bob Chilton ignites the rocket motor on the first test flight of the Flash Performance airplane. Photo taken from the gun camera on the chase plane.



Photo from the Lowell Ford Collection

Seconds after rocket motor ignition the test plane is leaving the chase plane behind. Burn duration of the rocket motor was one minute.

rocket power with engine burnout at 513 mph. Four more flights were made with the rocket powered Mustang, one more by Chilton, one by Barton and two by Capt. Snyder, USAAF.

An incident occurred on one of Capt. Snyder's flights, which nearly led to the loss of the aircraft. Snyder took off in the test P-51D on May 1, 1945, accompanied in chase by Bob Chilton. A fuel leak caused the cockpit to fill with noxious fumes which burned Snyder's eyes, and he announced that he was heading out over the ocean to bail out. Chilton suggested another solution that, in his thinking, was a more desirable course of action to save the airplane. He suggested that Capt. Snyder slow his plane down and open the canopy, thus flushing the corrosive fumes out of the cockpit and allowing him to return to Mines Field without getting wet and losing the airplane.

Though the test program had gone well, the final element would be "proof in combat", a milestone that would not be achieved. The bomber crews and escort pilots had noted the flight duration of the Me 262 and soon formulated a plan that exploited the Achilles' heel of the jet's flight characteristics. The flight duration was relatively short and as long as the jets could be kept in sight until they prepared to land, a loitering escort could shoot them down in the landing pattern. Implementation of "Seek and Destroy" tactics added to the demise of the Me 262 with attacks on parked aircraft and facilities, compounding the Luftwaffe's mounting logistical nightmare for fuel and spare parts.

As for the airplane that was used for the rocket tests, the Army Air Forces took delivery of 44-73099 on May 25, 1945 and it was taken to Eglin Field in Florida for performance tests by the USAAF. The Flash Performance program carried the Project Number of 4-45-18 E4698 and work began on June 8, 1945. Subsequent to the delivery of 44-73099 to Eglin, a second airplane, P-51D 44-74050 was added to the test program and modified by Aerojet personnel by the addition of an engine similar to that in the first plane, but with a reduced rated thrust of 690 lb and a duration of two minutes.

The program got off to a rocky start when the first flight of 44-73099 at Eglin had to be aborted due to fumes in the cockpit. During the final stages of servicing for the next flight, the fuel valves opened unexpectedly resulting in engine ignition and severe damage to structures and installations in the tail of the plane. A post-incident survey of the damage caused the airplane to be sent to salvage. Airplane 44-74050 continued in the test program, successfully completing four flights, two at 1,000 ft and one each at 5,000 ft and 20,000 ft altitude. Use of the rocket assist at these altitudes added 42, 53 and 56 mph to the airplane respectively.

The Flash Performance program was terminated on March 1, 1946 after 38 hours of test flight and 186 hours of static tests. In summarizing the program, the inherent dangers of using nitric acid were too excessive. It took five ground crew members a full workday to prepare the airplane for the next test flight. The installation of the equipment caused a rearward shift in the center of gravity too great to allow the 85-gallon fuselage tank to be filled to capacity, thus severely decreasing the stability of the airplane in a tactical role. The reduction of allowable fuel load to compensate for the aft CG location caused a reduction in combat range of 180 miles. The P-51 airplane equipped with aniline rocket motors was declared not operationally suitable and not useful for any military purpose by a letter of test results distributed on October 3, 1946. Another chapter in the history of the P-51 Mustang had thus come to an end.

About the Author: Lowell hails from Ocean Springs, Mississippi, located just a few miles east of Keesler AFB which accounted for many AT-6 and B-25 flights over his home. He developed an early interest in aviation and began flying forward swept wing gliders in 1949 while still in high school. He moved to California in 1962 and joined NAA/LAD as a Blueprint Folder and Trimmer. Except for a four-year stint in the military, he continued working until he retired from Boeing North American in 2003. From all his years of service, Lowell has acquired an encyclopedic knowledge of all NAA aircraft, especially the P-51. He currently resides in Torrance, California with his charming wife, Linda.

Keeping Mustangs Warm

by Dave Stern

Just prior to WWII, General H. "Hap" Arnold planned and initiated a project located in Alaska's interior known locally as the Golden Valley and encompassing Fairbanks, Alaska. His project was Ladd Field, the Army Air Corps' northernmost base. The airfield was rushed to completion in 1940 with one large hanger nearly completed when the newly created test facility known as the Cold Weather Test Detachment or CWTD initiated its research. Its mission was simple—testing USAAC aircraft in sub-zero temperatures that sometimes dropped as low as -70 degrees F in Alaska's interior.

Nothing hints of General Arnold being prescient but CWTD was created even as Greenland's Danish Administrator, Eske Brun, requested U.S. military and other assistance in resisting a possible German invasion and seizure of the Arctic island after Germany occupied Denmark. USAAC and Coast Guard aircraft were assigned to guard the west coast of Greenland and actually fought against German weather-radio troops on Greenland's east coast. Surprisingly, in 1940, prior to the Japanese attack on Pearl Harbor, bases were established along the Atlantic Ocean such as Goose Bay, Labrador, Iceland, Newfoundland, and Greenland where inclement weather well below zero occurred throughout the Arctic winter that sorely tried both man and machine.

Ladd Field CWTD personnel tested various USAAC aircraft under severe sub-zero conditions that extended many years after WWII ended. The NAA B-25 Mitchell medium bomber and an early Allison engined NAA P-51 Mustang were tested with skis. Numerous modification and refinements were created to allow bombers, fighters and transports to fly safely and to undergo standard maintenance in Arctic regions.

Let the reader take umbrage or conclude that the following information is derogatory or denigrating of North American Aviation's famous Mustang series of fighters. However, understand that WWII aircraft factories did not build aircraft specifically tailored to extreme geographical climes with inclement weather. The CWTD tested standard aircraft manufactured to USAAC/USAAF specifications and if found to be deficient... then the aircraft in question required modifications to reliably fly in Arctic conditions.

On 1 December 1945, the Army Air Force new Proving Ground Command (an environmental hanger test facility), initiated Project Number CW-4-45-3, to send to the CWTD two North American P-51H-10-NA Mustang fighters; their serial numbers were 44-64511 and 44-64518-two representative standard production aircraft minus any special winter modifications. While the tests were abridged due to a lack of experienced maintenance personnel, as a result of demobilization, the aircraft was found to be unsatisfactory for extreme low temperature flights as a consequence of insufficient carburetor heat, inadequate cockpit heating and frosting of the windshield among other deficiencies.

Ground temperatures that winter were recorded as -31 degrees F, with an average temperature of -40 degrees F in and around the Golden Valley. Both Mustangs were flown as much as possible in sub-zero temperatures that reached -50 degrees F without the use of wing or engine covers. Erratic engine performance, coolant and oil leaks were revealed and became a hazard during flight tests that reached 35,000 feet. While taxiing the Mustangs thick frost built up on the windshield and side portions of the canopy, forcing the pilot to perform instrument takeoffs.

Both Mustangs lacked external heat provisions, forcing ground crews to remove the lower engine cowling and apply heat from Herman-Nelson type heaters to the engine crankcase. Records state that during flight oil temperatures stayed within the required temperature range for this aircraft.

Propeller surging occurred in turbulent air and during fast pull-outs from a dive. Low altitude, low powers setting at 1,600 rpm and 34 inches manifold pressure did not allow for a quick increase in power because the engine would smoke and totally cut out. CWTD personnel were unable to determine the reason for the above conditions.

Installing a Koehler K-1610-B oil drain cock reduced freezing of the crankcase breather system or oil vent lines. Oil dilution was accomplished with Synthetic Lubricating Oil PPO-256 (Grade 1100); thus, supplementing engine pre-heating on the ground prior to run-up and takeoffs. The oil was easily diluted with the addition of a Thompson Centrifuge Pump in the breather system resulting in 30% oil dilution without pumping it overboard. Oil pressure gauges were removed, serviced or replaced at each 25 hour inspection.

Koehler K-1700B-2 and Whittaker drains were added to the main line strainer and proved to be superior to standard fuel drains. Fuel was drained 60 minutes after servicing but if water contaminated the fuel, naturally, the drains froze. A Chandler-Evans G-9 fuel pump replaced the factory installed Chandler-Hill G-9 pump with better performance, although this was not considered a cold weather problem.

Carburetor heat was inadequate so blank filters were installed during the test flights, with heat applied through the filtered-air door during ground and flight operations; full carburetor heat was necessary to maintain reasonable engine operation. The P-51Hs were equipped with a Janitrol heater delivering hot air into the engine compartment thus improving engine performance in very low temperatures.

The electrical system was considered adequate with no malfunctions occurring. Both Mustangs were flown using LE45 spark plugs (gaps were .016 on one aircraft and .020 on the other plane) and Northeast magnetos points set at .018. Only three plugs fouled requiring replacement, other than the 50 hour required inspection and replacement. The fouling problem was attributed to excessive engine loads during cold starts.

The airframe stood up to the extreme temperatures. However, Mustang 44-64518 displayed two bulges in the wing skins behind the gun housing compartment, and appeared previous to the guns being fired. One appeared between wing stations 88.25 and 97.25 on the starboard wing; the conclusion was that skin expansion during the extreme temperatures probably induced the bulges. Above ordinary maintenance was required for the cooling system during preflight and daily inspections. Cold flowing coolant plus expansion and contraction of the hose clamps induced many leaks, but were easily countered by re-torquing the clamps.

Flight controls stiffened up after 10 hours in the open air at -42 degrees F. Also, the throttle would not move due to congealed oil in the Simmons engine control unit; however, five minutes



Photo courtesy of Dave Stern

P-51Hs of the 66th Fighter Squadron, 57th Fighter Group fly in formation near Mt. McKinley, Alaska.

of ground applied heat allowed the throttle to move freely. The rudder would move out of trim on Mustang 44-64518 despite constant re-rigging. The problems with expansion and contraction of control cables became apparent with many USAAC aircraft, due to the extreme temperatures. Cables rigged according to the service manuals inside a hanger changed when the aircraft was rolled out the door into -20 degrees F and lower. The rudder trim-tab continued to creep and investigations by CWTD personnel determined that it was due to the very low sub-zero temperatures.

Cockpit heating was totally unsuitable for sub-zero operations. The "automatic" position for highest heat input and that of the "cockpit and windshield" was good down to -20 degrees F, but lower temperatures required the pilot dress in Arctic flying clothing-still, he remained cold due to a lack of heat. Temperature readings at 25,000 feet for 15 minutes of flying and an OAT of -50 generated left-leg temperatures of 0 degrees F, and right shoulder readings of 12 degrees F. The windshield defroster did not provide enough heat to defrost it during run-ups or take-offs. Pilots were forced to perform an instrument take off at temperatures below 0 degrees F. After five minutes of flight time the windshield began defrosting. A Janitrol heater of 50,000 Btu was installed in one Mustang and provided adequate defrosting and cockpit heat.

Other problems included the tail wheel—it refused to retract, or extend or would not lock in the extended position, including excessive slack in the tail wheel controls; all were officially blamed on sub-zero temperatures. One test pilot landed with a retracted tail wheel but caused only minor skin damage.

Weather conditions with snow packed in around the brake plates and pistons froze and locked them thus requiring constant attention that included frequent brake assembly replacements. Goodyear 27 inch all-weather tread tires were used in the CWTD tests. The AN/ARC-3 radios suffered numerous 6AKR receiver tube failures due to low power emissions caused by the low temperatures.

Once the primary trouble areas were identified and corrected or modified, the USAAF cum USAF sent a number of P-51H Mustangs to the Alaska Command for air defense during the post WWII era until jet fighters became reliable enough to replace reciprocating engine fighter airplanes.

The above were derived from USAAF Report CW-4-45-3, dated 1 March 1946; *Cold Weather Test of P-51H Type Aircraft.*

About the author: Dave Stern is a Pen Name. He served in the USAF with the 4080th Strategic Reconnaissance Wing for nearly 18 years involving cryptographic communications. Dave rebuilt and flew a Brantly B-2 helicopter in the Central Alaska Interior while performing maintenance on the DHC Twin Otter fixed wing aircraft and P&W PT6A-20 engines. Now retired, he resides in Renton, Washington and has published over 38 articles on aviation-aerospace history and other subjects.

Bald Eagles 50th Anniversary Reunion

Photos by Diane Prendergrast and Lee French



Featured Speaker James Albaugh, Boeing Commercial Airplanes



James Albaugh and Bald Eagles President Ed "Moke" Mokeslaveskas



Guest of Honor Martin "Buzz" Holland



Earl Theaker began the lumcheon with an invocation



Erik Simonsen



James Albaugh and Martin Holland



Ed Rusinek, Stan Barauskas, and Bob Hindy



Jean Theaker, Don Thompson, Shirley Baccaro, Lani Chan, and Amby Baccaro



Retirees Bulletin Staff – Stan Guzy, Sonnie Robertson, Ed Rusinek, and Bryan Hori (not pictured: Vince Ramirez)



Hank Francovig, Susan Cohen, Ace Evans, and Mike Luciano



Mike and Rebecca Aguilar and James Albaugh



Stephani and Ray Operacz, Rubye Richey, and Joe Onesty



Ann McClure and Dino Toigo



Lori and Wally Morgan



Howard Chambers, Scott White, Zung and John Pierro, and Wendy and Michael O'Connor



Shanon Self, Sharon Simonsen, Cathy Baker, and Lani Chan



Senior Airman Chris O'Connor



John Peller, Frank DeMattia, and Ed Lekawa



Lee French and Tore Johnson

"A bank is a place that will lend you money if you can prove that you don't need it."

— Bob Hope

Congratulations and Best Wishes to

William and Tina Pelzer of Whittier, California
celebrating their 66th Wedding Anniversary

John and Mary Ann Wilson of Torrance, California
celebrating their 56th Wedding Anniversary

George and Louise Page of La Mirada, California
celebrating their 55th Wedding Anniversary

Donald and Carol Ornellas of Fullerton, California
celebrating their 51st Wedding Anniversary

John and Jo Tranchina of Mesa, Arizona
celebrating their 44th Wedding Anniversary

Ann Tack and Steve McClure of Huntington Beach, California
on their Marriage

and to Express Our Love for Our Loving Wives

June and Stanley Guzy of Garden Grove, California
celebrating their 58th Wedding Anniversary

Krystyna and Edmund Rusinek of Rossmoor, California
celebrating their 58th Wedding Anniversary

May you have
Enough happiness to make you sweet,
Enough trials to make you strong,
Enough sorrow to keep you human, and
Enough hope to make you happy.

Contrails From The Past

by Ed Rusinek

Dear Ed,

Many thanks for keeping alive a great tradition and a wonderful magazine for us.

— David Kennedy, Orange, CA

Ed's Ans.: 2012 is the 13th year since Boeing cut us loose, armed only with the address list of the NAA retirees that had received free copies of the NAA Retirees News. We sent out a "Hail Mary" of the NAA Retirees Bulletin to all 9,600 retirees and received checks from 3,300 including Bill Halprin of Las Vegas who enclosed an additional $500.00 donation. Over the years, the original five members of the editorial staff have increased the Bulletin from 12 to 16 to 20 pages and will publish our 50th issue this year. To help us in this endeavor, we had the exceptional and generous help of over 130 authors and artists. Most were NAA family but others were professional writers who considered it an honor to help.

To perpetuate the name North American Aviation into the future, the Bulletin endowed the U.S. Air Force Academy three years ago to present three awards for outstanding achievement to the graduating first-class cadets in aeronautics and astronautics and a fourth award to the top graduating cadet candidate from the Prep School. Last year and this year we have sent speakers to address the Cadets and Faculty at the Academy.

We are only the vicissitude of the greatest aerospace company that ever existed. But, we will be damned if we are willing to go out softly. That is why we have adopted the Masthead Motto: "Where the Best Never Rest". We are the Best!

Dear Ed,

The Bulletin just keeps getting better with each issue! Enclosed is for best use.

— Stan Thimakis, Tustin, CA

Ed's Ans.: Wow, Stan! You certainly know how to "frame" your compliment. Thank you for a most generous gesture.

"This country has gotten where it is in spite of politics, not by the aid of it.

That we have carried as much political bunk as we have and still survived show we are a super nation."

— Will Rogers

NORTH AMERICAN AVIATION:

The Rise and Fall of an Aerospace Giant

by John W. Casey with Jon Boyd



Read the true account of North American Aviation's only two CEOs: "Dutch" Kindelberger and Lee Atwood. One would oversee its rise, and the other would oversee its fall across the tumultuous backdrop of the Age of Flight. The story provides perspective on why things happened, shares anecdotes about the people and the airplanes, and what both did for aviation. Their achievements and what they represent in our imagination is the stuff of legend.

Author John W. Casey worked 27 years at NAA where he developed an unparalleled aftersales engineering and technical services department. Author Jon Boyd is a retired Air Force pilot and the author of several books.

North American Aviation: The Rise and Fall of an Aerospace Giant

Hard cover, illustrated, keepsake book $19.95 available at ampubbooks.com, amazon.com, or your favorite bookstore

eBook for Kindle available at amazon.com

eBook for iPad and iPhone available in the iTunes store

The Silent Majority

by Stan Guzy

McLUCKEY, JOHN A. – former President of Boeing Space Systems died on April 13, 2012 after an extended battle with pancreatic cancer. During a career that spanned four decades, he played a key role in shaping the aerospace and defense programs at NAA/RI and Boeing. Before retiring in 1998, he led the integration of McDonnell Douglas and Boeing which led to the forming of what is now Boeing Defense, Space and Security. He was instrumental in the establishment of the Autonetics monument located on the original site. He is survived by his caring wife Sharon.

BECKHAM, JOHN N., 86 – died in June 2011. John served as a B-24 pilot in the USAAF during WWII. He joined Autonetics in 1960 and worked on many programs before retiring in 1987. He is survived by his wife Dottie.

DICKINSON, CARL J., 87 – passed away in Owasso, OK on March 31, 2011. After service in the U.S. Navy during WWII, Carl joined NAA and served at the Columbus, LAD, Space, KSC and Tulsa Divisions before retiring as a Program Manager in 1986. He is survived by his wife of 59 years, Doris.

DOTY, ROBERT L., 93 – died in Orange, CA on March 13, 2012. Robert enlisted in the Navy at 16 and fought in WWII aboard the *USS Louisville*. He earned a Ph.D. in Electrical Engineering from the University of Iowa and led in innovations in microelectronics during his 35-year career at Autonetics. His wife of 67 years, Marjorie, passed away on March 6, 2012.

DUNN, ROBERT E., 93 – of Orting, WA, passed away on April 13, 2011. Bob retired from Space Division in 1981 with 35 years of service.

FORMAN, ARCH A., 93 – of Rolling Hills Estates, CA died on December 9, 2011. Arch retired from Engineering Flight Test at LAD in 1989 with over 40 years of service. He is survived by his loving wife of 69 years, Evelyn.

GLASSER, MARJORIE A. "MARGE", 79 – of Laguna Woods, CA died on March 20, 2012. Coming to California in 1982, Marge worked at the Marine Systems Division until she retired. She was preceded in death by her husband Ron.

GRAZIANO, WILLIAM D. "BILL" – of Palos Verdes, CA passed away on April 4, 2012. Earning a B.S. degree, Bill served in the USAAF during WWII as a meteorologist. After the war, he obtained his M.S. in Aero Engineering from Caltech and joined LAD. His capabilities led to many high level assignments in the Structures/Technology disciplines. Bill retired in 1992 with 45 years of service. He is survived by his loving wife of 64 years, Mary Joyce.

HARKER III, EDWARD B., 76 – passed away in Thousand Oaks, CA on May 6, 2011. Obtaining his degree from Cal Poly San Luis Obispo, he joined NAA as an engineer and retired in 1996. He is survived by his wife of 55 years, Jean.

HERSCHLER, WILBERT "BILL", 83 – passed away peacefully in his sleep on January 17, 2012 in Torrance, CA. After serving in the U.S. Army Air Forces during World War II, Bill moved his family to California and joined NAA. He worked on wiring and cable assemblies for many programs including the B-1, Sabreliner and Apollo. He retired from LAD in 1988 with 39 years of service. He is survived by his loving wife of 64 years, Rita.

HOLLAND, ETHEL MAE, 89 – died in Bourbonnaise, IL on March 2, 2012. Ethel Mae attended the Tuskegee Institute and graduated from Tennessee State University in Nashville, TN in the Class of 1943. After graduation, she moved to California and joined NAA at LAD in the Engineering Planning Group. She is remembered as a charming lady and a very competent planner. Ethel Mae retired with 49 years of service.

KAFFENBERGER, DUANE, 73 – died on April 7, 2012. He retired from Autonetics in 1994 with 38 years of service as a mechanical engineer. He is survived by his loving wife Kathy.

KENYON, HOWARD A., 86 – of Cerritos, CA passed away on March 12, 2012. Howard served with the Navy in the South Pacific during WWII. Graduating from Georgia Tech with an Aero Engineering degree, he served on many high profile programs. Retiring from Space Division in 2000 with 35 years of service, he became a patent attorney and helped numerous clients to get their patents. He is survived by his loving wife Diane.

KREIDER, PETER A., 86 – passed away in Napa, CA on February 10, 2012. Peter retired from Collins Radio located in Cedar Rapids, Iowa in 1981 with 33 years of service. He is survived by his wife Barbara.

KUNZE, MARILOU, 80 – of Newhall, CA, passed away on May 20, 2012 after a valiant struggle with liver cancer. Marilou started at LAD in the Pricing Department in 1952. She developed her skills and later transferred to Autonetics Pricing and, finally, to Rocketdyne Pricing. She always enjoyed her work and retired in 1987 with 35 years of service.

KURZ, ANTHONY "TONY", 77 – passed away at home in Winchester, OR on November 8, 2011. Tony retired from Autonetics as a Finance manager in 1990 with 30 years of service. He is survived by his loving wife Joyce who is also a retiree with 30 years of service.

LANGON, E. L. "DUTCHIE", 88 – of Downey, CA passed away on February 10, 2012. Retiring from the Space Division in 2000 with 50 years of service as a parts expeditor, Dutchie served at LAD, Butler Hangar, Bell Warehouse and Downey. She was always quick with a smile, a cheerful word and a happy disposition. Good Night Dutchie!

LOKKE, BRUCE H. – of Paso Robles, CA passed away on May 1, 2012. Bruce was a Tech Writer on the Sabreliner, Apollo and Skylab programs with 35 years of service, retiring from Space Division in 1983.

LOTGERING, GENE E., 81 – passed away on March 13, 2012 in Mountain Home, AR. He served in management on the Space Shuttle thermal control and numerical control tiles design areas. He was president of the NAA/RI National Management Club and retired in 1990 with 40 years of service. He is survived by his loving wife Phyllis.

McKEEN, HOWARD BRUCE "MAC", 88 – succumbed on February 26, 2012 in Lancaster, CA. He attended the Northrop Institute of Technology and served as an Army Air Forces bomber pilot during WWII. Mac joined NAA in 1950 and served as a flight test engineer at Palmdale and Edwards AFB on many projects including the A3J, B-70 and B-1 aircraft. He retired in 1983 as a flight test manager.

PETERSON, BENJAMIN G., 88 – of Rancho Palos Verdes, CA passed away on February 9, 2012. Ben retired from LAD in 1981 with 35 years of service.

PHILLIPS (CROSBY), PATRICIA A., 88 – of Orange, CA passed away on February 13, 2012 after a short illness. Pat served as a scheduler and planner at Rocketdyne for 28 years when she retired in 1981. She enjoyed being a team member for the Shuttle and went to KSC to witness a Shuttle launch. Patricia was much loved and will be sorely missed.

PHILLIPS, WILLIAM R. "BILL" – subscription reminder card returned to the Bulletin indicating that Bill passed away in Las Vegas, NV in May 2010. He retired from the B-1 program at LAD in 1979 with 39 years of service.

RODRIGUEZ, ARTHUR W., 85 – passed away on February 6, 2012. Rod was a WWII Marine veteran, having participated in several island landings and receiving the Purple Heart after the heated battles of Iwo Jima. He also served as a combat artist in Korea before joining NAA as a technical illustrator on the Apollo program. In retirement, he focused on his painting talents.

SCOBLE, AL, 69 – reported to have passed away on March 16, 2010 as a result of a heart attack. Al worked his way up the ladder of success, joining NAA in 1958 as a mailroom employee and advancing to Director of Purchasing for the B-1 program. He retired in 1995 with 36 years of service.

SEITZ, PAUL F., 75 – passed away in Woodland Hills, CA surrounded by his loved ones. After receiving an Engineering Masters degree from USC, Paul joined Rocketdyne and helped pioneer engines for the Apollo and Space Shuttle programs. Respected by his peers, he received the "Robert H. Goddard Space Propulsion Pioneer Award" in 2009. He is survived by his wife of 54 years, Carolyn.

SIDES, IRA L., JR., 82 – passed away at home in Inglewood, CA on February 23, 2012. Ira started at LAD and retired from Space Division in 1992 with 45 years of service in electrical fabrication. He is survived by his loving wife Lola.

SMITH, EMERSON W., 89 – died in Charlottesville, VA on April 24, 2012. Emerson received his Masters degree in Mechanical Engineering from Cal Tech and joined NAA at the Columbus Division in 1952. He retired in 1970 with 19 years of service. Among his accomplishments he designed the ejection seat for the F-100 Super Sabre and was the Director of Engineering for the OV-10 Bronco aircraft. Emerson was predeceased by his loving wife of 63 years, Elizabeth.

STINSON, WILLIAM R. "BILL", 79 – died at home in Gold Beach, OR with his family at his side. Bill was an engineering scheduler on the B-1, Apollo, Shuttle and SDI programs. He retired in 1994 from Space Division with 32 years of service. An avid reader and historian of WWII, Bill volunteered many years of service at the Chino Air Museum. He is survived by his devoted wife, Margaret.

STRONG, INGMAR "AL", 85 – passed away on January 8, 2011 from undisclosed causes. He is survived by his wife Mary Ann.

TAYLOR, GERALD K., 82 – of Rancho Palos Verdes, CA died on February 17, 2012 of complications of cancer. After serving for 20 years as an Air Force pilot, he joined NAA as a Sabreliner production test pilot and a project engineer on the B-1. He is survived by his wife Betty.

TIPTON, HAROLD F. "HAL", JR. – of Villa Park, CA passed away on March 16, 2012. Hal received a B.S. in Engineering from the U.S. Naval Academy, an M.A. in Personnel Administration from George Washington University and a Certificate in Computer Science from the University of California at Irvine. He was a Naval aviator with the rank of Commander when he retired in 1969 with 20 years of service to his country. He joined Rockwell and became Director of Computer Security. He instituted many technological advances before his retirement in 1994. He is survived by his wife of 62 years, Margaret.

WINANS, MERYL K., 82 – of Las Vegas, NV died on March 29, 2012. Meryl served in the USAF during the Korean War. Earning an engineering degree, he joined Autonetics as a Manufacturing Engineer. Meryl retired in 1988 with 27 years of service. He was very active in the Civil Air Patrol and owned an NAA Navion and a Beech Bonanza. With the CAP, he was credited with finding and helping rescue a powered paraglider pilot who crashed in a remote mountain area in Nevada.

YOUNG, HOWARD C., 92 – of Lancaster, CA passed away on April 9, 2012. Howard started with NAA in 1942, left to serve with the 38th Infantry Division in the South Pacific and returned to NAA in 1946. In 1972 he moved his family to the Antelope Valley where he served on the B-1 and Space Shuttle programs until his retirement in 1980. He is survived by his wife Rose.

ZIMMER, FRED – passed away peacefully on January 20, 2012 in Frisco, TX with his family at his side. Fred retired from the Corporate Offices in 1994 as Corporate Vice President of Contracts and Pricing with 42 years of service. He is remembered by his colleagues as a person of integrity, knowledge and focus on the best interests of the company and its people. He is survived by his loving wife of 60 years, Nancy.

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NORTH AMERICAN AVIATION
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North American Aviation Retirees Bulletin
"Where The Best Never Rest"

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Photo by Diane Prendergast Photography

The new Board of Directors of the NAA Bald Eagles was presented at the 50th Anniversary Reunion. The Board Members include (Front Row, L to R) Lani Chan, Maxine Haun, Pat Cunningham, Larry Livers, Pete Magoski, Earl Theaker, Joe Onesty, and Dumont Wing. Back Row (L to R), Ed "Moke" Mokeslaveskas, Erik Simonsen (Chairman), Cathy Baker (Vice Chairman), Amby Baccaro (Treasurer), Ray Operacz (Secretary), and Stan Guzy (Sergeant at Arms).

NORTH AMERICAN AVIATION
Retirees Bulletin
"Where The Best Never Rest"

Fall 2012

Inside:

NAA AT CAPE CANAVERAL AND KSC – PART VI by Bill Edson

NAA "FORGOTTEN" AT THE AIR FORCE MUSEUM by Ed Rusinek

SPACE WALK OF FAME MUSEUM by John Tribe

WHERE DO WE GO FROM HERE? by Larry Korb



Photo courtesy of Historian Christian Gelzer, Ph.D.

In 1959, six of the Mercury Seven astronauts visit the Flight Research Center at Edwards Air Force Base to examine the world's first space plane. Proudly explaining the details of this splendid machine, X-15 pilot Joe Walker (left) provides a glimpse of what awaits them in Space to astronauts Scott Carpenter, Gordon Cooper, Gus Grissom, Wally Schirra, John Glenn, and Alan Shepard.

NORTH AMERICAN AVIATION
Retirees Bulletin

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The NAA Retirees Bulletin can be contacted at The Boeing Company, Seal Beach facility by phone at (562) 797-3836. Send mail to:

North American Aviation Retirees Bulletin
P. O. Box 3797
Seal Beach, CA 90740

NAA RETIREES BULLETIN VOLUNTEERS
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Dear NAA Retirees Bulletin Subscriber

Several months ago we planned to start a new series of articles called *"The Many Faces of North American Aviation"*. Although, we invited several retirees to do an autobiographical sketch about themselves, the response has been slow in coming. In June, we received an obituary which was obviously well prepared but with the date of death and age at the time of death left blank and that information handwritten in some time later. The obituary was for Mary Cameron and was sent to us by her daughter, Dr. Kate Cameron Froeberg, owner of the Cameron Veterinary Hospital in Sunnyvale, California. Stan called Dr. Kate and found out that her mother had prepared her own obituary with instructions to fill in the missing data and to send it to Editor Ed Rusinek. When you read her obituary you will find a woman with a fantastic attitude, ready to tackle every assignment with verve and panache. She started at eighteen as a 60¢ per hour Manufacturing record keeper at LAD, transferred to Missile Division in Downey and then to Autonetics in Anaheim. She was the first woman employee to receive the 35 year service watch and, subsequently, she retired with the highest management rank ever achieved by a woman at NAA or Rockwell. Mary Cameron, in recognizing your North American Aviation Spirit, it would have been an honor and a privilege to shake your hand!

Many of you have asked about the series of articles regarding NAA activities at the Kennedy Space Center. Well, Bill Edson is back with another chapter! He is still reviewing a mountain of data that he has accumulated over the years and is providing us a compendium of information about KSC that future historians will cherish for years to come.

A wise man once said, "19th Century Man had Beliefs and he built cathedrals that will stand for hundreds of years. 20th Century Man has Ideas and he builds Nothing!" I think back to my forty-nine year career with North American Aviation and I wonder, "Was I trapped in some sort of Time Warp? Was I just dreaming all the things we accomplished? How could a company that had such fantastic talent that could achieve everything with a T-Square, a pad of Vellum and a Slide Rule just disappear?" He doesn't provide all the answers but Larry Korb is back with his report, *"Where Do We Go From Here"*. He discusses the Past and projects some ideas for the Present and the Future. It is frightening because he shows that even nations that were once considered too far behind to count are now moving into Space and we are beginning to look like a dusty African village with chickens clucking in the streets! General Motors just completed eleven new fully automated automobile factories and four parts factories in Red China with their share of the 80 Billion U.S. Dollars GIVEN GM supposedly to recover IN AMERICA! Is this more Obamacare at work? Cluck! Cluck! Cluck!

Our Silver Eagle subscriber, Nolan Leatherman, Columbus Division Contracts, called to inform us that he visited the USAF Museum at Wright-Patterson AFB recently and found many handsome examples of NAA aircraft and missiles. All properly identified and strategically displayed. However, at the entrance to the museum was a wall of plaques representing American aviation/aerospace companies but none for North American Aviation, Inc. At our urging, he met with two representatives from the museum. We include his report from that meeting.

Our Sonnie Robertson is still fighting her debilitating eye issues so we are very short handed. If possible, please continue to remember her in your prayers. In the meantime, Stan and I are coping with the subscription list. Fortunately, Stan is very savvy with finances so we manage to keep the Bulletin solvent and current. However, with the year coming to an end, if the date above your name and address is December 2012, the next issue will be your last unless you renew. If you do it early, it will reduce our workload at the end of the year and eliminate the need for mailing out reminder cards.

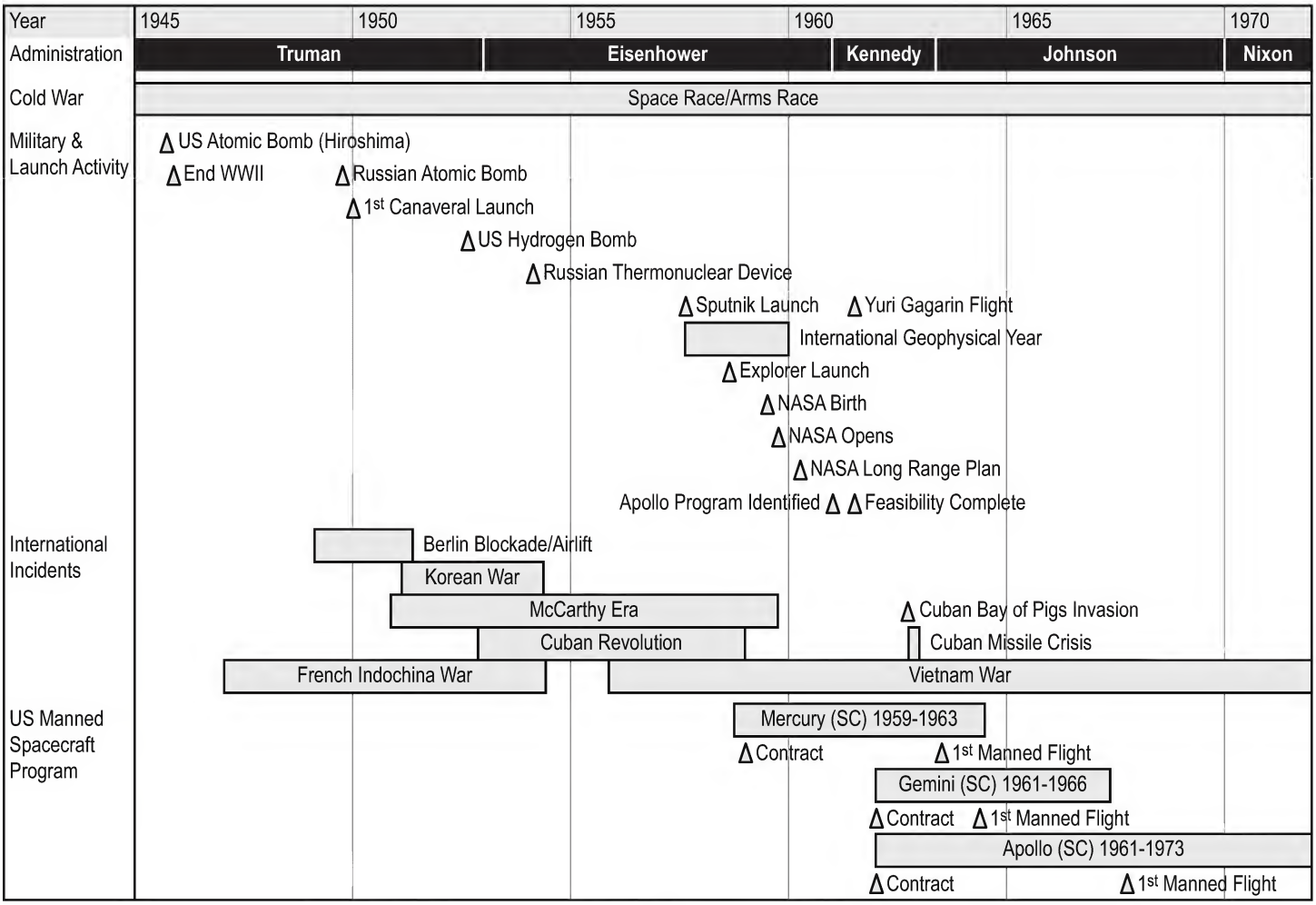
Stay healthy! Keep moving! Make it hard for the Devil to find you!

NAA at Cape Canaveral and KSC – Part VI

by Bill Edson

Challenges and Opportunities Post-World War II

Over the past several years I have written a series of articles for the NAA Retirees Bulletin that briefly described the development and evolution of the United States manned Apollo spacecraft program post-WWII at White Sands Missile Range (WSMR) in New Mexico and at Cape Canaveral and the Kennedy Space Center (KSC) in Florida. The initial articles briefly summarized the beginning and continuation of a "Cold War" between the post-WWII United States and Russia, the first U.S. rocket launches from WSMR and from the "Cape", and the resultant "Space Race" between the two nations from the late 1940s to the late 1960s. The Cold War could best be viewed as an expression of an ideological struggle that then existed between Communism and Capitalism. The articles reflected the posturing of NAA to capture aircraft, missile and spacecraft contracts in that timeframe. In 1957, we experienced a real "downer" with the launch of the Russian Sputnik series of satellites as they preceded us into space while relying on the thrust of a military ICBM to deliver their payload. As we regrouped from the surprise launch, we cautiously accelerated our civilian and military missile development programs, established the National Aeronautics and Space Administration (NASA) to manage our civilian space effort and initiated development of the Mercury, Gemini, Apollo and Skylab launch vehicle and spacecraft projects. As I completed each Retiree Bulletin article, I placed emphasis upon the participation and performance of the NAA Apollo ground operations personnel (my area of expertise) located and functioning at the various operational and launch sites during those exciting early days of the program. NAA entered the missile and space business to help ensure that peace was maintained throughout the world while an understanding of the universe in which we live, from a scientific perspective, could be studied and developed. At NAA, while we accepted and relished the opportunity to expand our business base from the aircraft world into what appeared to offer a very exciting future in space, we welcomed the challenges it provided to us over the years. In performing the research essential to the development of this article I recognized how fortunate I was to have lived in the post-WWII era and to have been a part of its history. While assembling the various articles, I have tried to convey a message of what our responsibilities were at the Cape and at KSC and how and when we accomplished them. Previous articles have neglected to discuss to any great extent the impact that WWII had on the social, political and economic scenes around the world and how it affected our generation and future generations. This article, *NAA at Cape Canaveral and KSC – Part VI*, is focused on the timeframe post-WWII and immediately preceding the conception and initiation of the Apollo Program in 1961. In it I have identified several of the more significant activities, organizations, individuals and problems encountered at that time while ensuring the identification of a U.S. national space program.



Initiation of the "Cold War" – United States vs. Russia

World history tells us that while Robert Goddard was launching rockets in the U.S. in the late 1930s, Wernher von Braun and his team had relocated to Peenemunde to help expand the German rocket development program while Russia established rocket test centers in Kazan, Leningrad and in Moscow. At the time of the German collapse in May 1945, more than 20,000 German V-1 flying "buzz" bombs and V-2 ballistic missiles had been launched against our allies. Franklin D. Roosevelt, the 32nd President of the U.S., was a central figure in world events during the mid-20th Century and led our country through a world wide economic depression and through most of the World War II. He passed away on April 12, 1945, shortly before the end of the war. The U.S. tested its first nuclear fission device (atomic bomb) at Trinity Site, near Alamogordo, on the New Mexico desert on July 16, 1945. The deployment of the atomic bomb by the U.S. against Japan in August 1945 led to the Japanese surrender a month later. Among the legacies of WWII there was an array of new technologies spawned by the massive military effort of our country. Computers, radar, antibiotics, telemetry, high strength metals, the jet engine, large higher energy liquid fueled rockets, and a multitude of other inventions seemed predetermined to shape the destiny of the world. Atomic energy and the atomic bomb were to become the most feared and threatening technological changes of that era. The Cold War between the U.S. and the Soviet Union began after the joint successes of a temporary World War II alliance between the United States and Russia against Nazi Germany. After WWII, the Soviet Union became wary of its former ally, the United States, who at that time was in sole possession of a nuclear weapon. In the late 1940s, unknown to most, the U.S. was in the early stages of study and development of small ballistic missiles. In 1947, when the Truman Administration reorganized the U.S. military, the Air Force became an autonomous branch of it rather than remain as a division of the U.S. Army. With that change; we established a stronger military posture, had the capability to maintain air bases in proximity to Soviet territory and could deliver atomic weapons if necessary but only with aircraft and over much shorter distances. To counter the perceived U.S. Air Force military threat, Russian Premier Joseph Stalin, the dictator of the USSR from 1929 to 1953 ordered the Russian development of ICBMs. Our possession of the atomic bomb and the mutual distrust of the two world powers for one another was the primary reason for the initiation of the Cold War. After WWII, while "Operation Paperclip" was transporting German scientists, including Wernher von Braun, to this country to support our rocketry effort at WSMR, German engineers captured by Russian forces were forced to work in Moscow under Sergei Korolev, the Chief Designer of Russian rocketry, to further develop large Russian ballistic missiles. In the late 1940s von Braun and his associates from the German rocket program, while working for the U.S. Army at Fort Bliss, Texas and at WSMR, tested larger and improved versions of the V-2 rocket. It was then that the U.S. Air Force had its origin in ballistic missile studies and on test projects. Their prime effort at the time was aimed at mating the V-2 ballistic missile and the atomic bomb, a union that had the potential for a revolution in strategic warfare. Discussion of interplanetary travel had been on-going for hundreds of years, but there hadn't been a firm technical foundation for it until after World War II when suddenly liquid fueled rockets began to show promise as a transportation system. In the same timeframe, the National Advisory Committee for Aeronautics (NACA) began experimenting with air launched rocket planes.

Expansion of the U.S./Soviet "Cold War" Into the 1950s

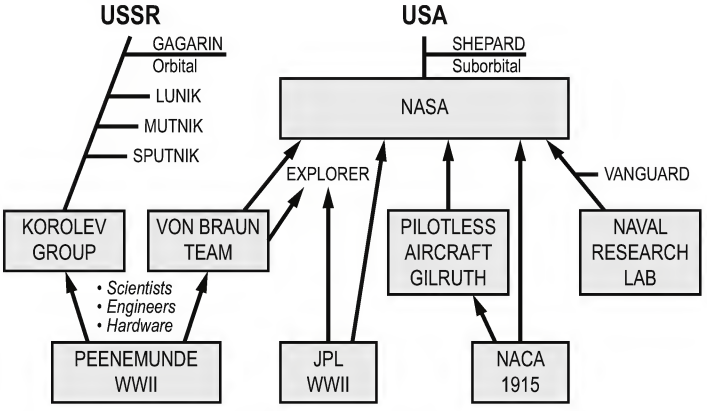
On August 29, 1949, the Soviet Union successfully tested its first atomic bomb. From 1946 until 1990, the world was in a continuing state of political conflict, military tension, and economic competition between the Communists, primarily the Soviet Union and its satellite states and allies, and the Western World, the United States and its NATO allies. After World War II, the USSR and the U.S. saw each other as mutual superpowers existing with profound economic and political differences. At times, it appeared that a nuclear arms race existed between the U.S. and the Soviet Union to develop and accumulate nuclear weapons for potential use upon the other. Because the use of nuclear weapons would probably have assured the destruction of the other, the chief military powers in the world at that time never engaged in a major battle. The first missile launch from the Cape occurred in July 1950. In the same time frame, von Braun and many of his German associates transferred from Fort Bliss and WSMR to the Army Ballistic Missile Agency (ABMA) in Huntsville where they led the development of the Redstone, Jupiter C and, eventually, the Saturn series of space rockets. In the early 1950s, the U.S. military, supported by their contractors, were the primary users of the launch facilities at Cape Canaveral and of the new Florida Missile Test Range. In that timeframe many small missile test programs i.e., Bumper, Vanguard, Redstone, Snark, Navajo, etc. were initiated. From the late 1940s through the early 1960s, numerous social, economic, and international situations threatened our position as a post-WWII power. In November 1952, we detonated the first hydrogen bomb and the Russians surprised the world when, less than a year later, they exploded a deployable thermonuclear device. In the early 1950s an Air Force "Strategic Missiles Evaluation Committee" feared that the slow pace of America's strategic missile programs would be detrimental to the security of the country if not altered. After an evaluation of the situation, Brigadier General Bernard Schriever established a new Air Force Western Division in Los Angeles to control Air Force Missile Programs. Within a year, the Atlas Program schedule had been reoriented and accelerated. In addition, development contracts had been released to the aerospace industry for development of a Titan ICBM and a Thor IRBM that would be utilized in lieu of aircraft to deliver nuclear warheads.

International Activity in the Late 1940s and Early 1950s – In the late 1940s and into the early 1950s, the international situation was dominated by the Berlin blockade and the subsequent Berlin Airlift (1948-1949), Korean War (1950-1953), McCarthy era of communist influence (late 1940s to late 1950s), Cuban Revolution (1953-1959) and by the initial U.S. support of French Indochina (early 1950s), a prelude to the Vietnamese war. The list of problem areas was overwhelming. In this country, the Civil Rights Movement peaked between 1955 and 1965 with both violent and non-violent activities, protests, marches, sit-ins, etc. occurring on a regular basis. In the 1952 Presidential election, Dwight D. Eisenhower defeated Illinois Governor Adlai Stevenson and became the only general to serve as a U.S. President in the 20th century. Richard Nixon's strong vocal opposition to Communism carried him to the Vice-Presidency. Eisenhower's Presidency was dominated by the Cold War. Dur-

ing his Presidential campaign, Eisenhower had promised to win the stalemated Korean War. In July 1953, he kept his promise and signed the Korean Armistice agreement. Under Eisenhower's Presidency the U.S. became a global nuclear power. After the death of Stalin in 1953, Eisenhower had hoped it would be possible to come to an agreement with the future Russian leaders to halt the nuclear "Arms Race". His effort to reach a disarmament agreement during his Presidency failed as did multiple attempts at convening a summit conference to discuss and to perhaps resolve our differences. By the mid-1950s the Cold War had worked its way into the fabric of everyday life in both the United States and Russia. The concerns were fueled by the nuclear Arms Race and the growing threat of nuclear weapons, by the wide-ranging espionage and counter-espionage activities between the two countries, by the continuing discontent in Korea and because of the clash of words and ideas heavily documented in the media on a daily basis. As a result of the Cold War and the internal and international social, economic and political environment in which we were living in the mid-1950s, the American people became very anxious. They were especially concerned that the development of our best offensive and defensive weapons, intermediate and long-range ballistic missiles, was seriously lagging that of the Russians and that our national security was in danger.

Surprise Launch of Sputnik 1, October 4,1957

In 1952, the International Council of Scientific Unions decided to establish the timeframe from July 1, 1957 to December 31, 1958 as the International Geophysical Year (IGY). The cycles of solar activity were expected to be at a high point at that time. In October 1954, the council adopted a resolution calling for artificial satellites to be launched during the IGY to map the Earth's surface. The Naval Research Laboratory's (NRL) Vanguard missile was chosen to represent the United States and was to be launched during that year. While the proposed U.S. launch plan for the Vanguard rocket floundered and ran behind schedule, the Russians surprised us. On October 4, 1957, it was a Korolev-designed R-7 ICBM that carried the first man-made satellite, Sputnik 1, a 184-pound, 23-inch diameter steel sphere, into earth orbit. The propaganda value of the launch alone at the height of the tension filled Cold War was enormous. The world listened to the "beep-beep" of its radio signal for three weeks until the radio transmitter batteries lost their power. The satellite burned up as it re-entered the earth's atmosphere on January 4, 1958. The Soviet Union went on to launch a series of Sputnik satellites—one of which carried a dog named Laika into space.



USSR and United States Space Teams

On the day of the first Sputnik launch, most of the large missile related activities of the U.S. revolved around the development of ICBMs and IRBMs being managed by the three U.S. military service branches and their respective industrial contractors. At that time, five missile systems were under development and accounted for most of our large missile launch activity, none of which was considered operational.

U.S. Response to the Launch of Sputnik 1 – The news of the Russian launches provided another red flag to those concerned about our rapidly eroding relations with the Soviet Union. While U.S. officials congratulated the Russians for their accomplishments, many Americans thought that the Soviet Union had staged a tremendous coup for the communist system at our expense. The public feared that the Soviet ability to launch satellites into earth orbit also translated into a capability to launch ballistic missiles that could carry nuclear warheads from Europe to the United States. After the Sputnik 1 launch, the American people were of a near unanimous opinion that we should immediately become more active participants in the Space Race if we were to maintain our position as a world leader. Many frightened citizens felt it imperative that the civilian and military offensive and defensive needs of our country become more clearly visible and that we should be reassured that new technologies were under development to satisfy those needs. In late 1957, the U.S. Congress, alarmed by the perceived threat to national security and technological leadership urged that immediate action be taken to minimize our fear. The Congressional position that under no circumstance should the Soviet Union be allowed to establish a foothold in outer space, especially if any of that area should one day become militarized was a harsh warning.

Congressional Committees at Work 1957-1958 – Upon the launch of the world's first artificial satellite on October 4, 1957, the attention of the United States turned to its own struggling space program. The U.S. Congress, alarmed by the perceived threat to technological leadership and national security, urged immediate and swift action. The leaders of our country initially were not unified in their thoughts on who should manage our space program, but the desire for change was unanimous. Subsequent to the launch of Sputnik 1, President Eisenhower and his advisers recognized the seriousness of the problem facing our country and chose to move very deliberately. His response to the concerns of the American people led to a near mutual understanding that a new federal agency, *possibly an expansion or extension of an existing agency,* was needed to better control both civilian and non-military space activities. For the next several months, November 1957 - July 1958, a debate on the subject flourished. While the military was attempting to "beef up" their activities in space, NACA—at the direction of Hugh Dryden, its Director of Research—assigned a committee to investigate the ramifications of imposing civilian control over our national space program. The intent of the committee was to identify the goals and objectives of the new agency, organizational changes that the creation of the new non-military space function might dictate, how that agency would interface with each of the branches of the U.S. military and other governmental functions, the nature and scope of its responsibility and accountability. On January 14, 1958, NACA released a document titled "A National Research Program for Space Technology" that proposed that space oriented scientific research and technology become the responsibility of a national civilian agency and that NACA could become that

agency if a rapid extension and expansion of its present effort were made possible. After the launch of Sputnik 1, work was immediately initiated to expedite the launch of Explorer 1, the first U.S. satellite to be sent into space. The push to organize a national space program became greater on December 6, 1957 when the Vanguard TV3 rocket climbed about a yard above its Florida launch pad before falling back and exploding. When the backup Vanguard launch vehicle TV3 BU suffered a ground failure, the Explorer 1 launch vehicle was replaced by an ABMA Juno I. After resolving a few minor technical glitches with the satellite, officially called 1958 Alpha, it was successfully launched on February 1, 1958. Explorer 1 carried a 31-pound scientific payload, significantly smaller than those carried by the Sputnik series of satellites. The Explorer 1 launch led to the discovery of the magnetic radiation belts around the earth that were subsequently named after Dr. James Van Allen. Between November 1957 and March 1958 the U.S. Senate under Majority Leader Lyndon B. Johnson and the House of Representatives under Majority Leader John W. McCormack held a series of committee meetings to discuss the pros and cons of a military and/or civilian space agency and the potential impact of that decision. In January 1958, Hugh Dryden established a Special Committee on Space Technology, comprised of a unique group of high powered technical and management personnel led by Dr. Guyford Stever, an Associate Dean of Engineering from MIT as its Chairman. The Stever Committee was given a mandate to identify, develop and expand the objectives of a U.S. civilian space research organization that would better compete with the Soviet space program. The primary role of the committee was to identify, locate and harness the technical, research, development, and management capabilities required to ensure U.S. preeminence in international space activities and in the identification of near term and long-range space planning milestones. Throughout 1958, numerous working groups supported by experts in their respective disciplines from around the country worked diligently to identify the major hardware elements of a national civilian space program and the associated research effort that would be required to support them. Many of the early "space pioneers" were involved as team leaders and/or participants in the various working groups. In the final report released in October 1958, the Stever Committee provided their recommendations to be incorporated into the "National Civil Space Program". Meanwhile, in the Executive Branch of government, President Eisenhower asked his science advisor, Dr. James R. Killian, Jr., a former president of MIT, to convene the Presidential Science Advisory Committee (PSAC) for deliberations on our national space program. Several weeks later Killian, the chairman of the committee, submitted a document to the attention of President Eisenhower titled "Organization for Civil Space Programs". The memo proposed that a civilian space agency be established and that it be built around a strengthened and re-identified NACA organization. Eisenhower and his presidential advisors reviewed the recommendations of the PSAC and were extremely impressed and agreed with the data presented. On March 5, 1958, Eisenhower approved a memorandum signed by Nelson Rockefeller, chairman of the President's Advisory Committee on Government Organization to proceed with the change. During the following weeks, legislation was drafted by the Bureau of the Budget, NACA and representatives of Killian's office. The legislation that emerged called for a new agency rather than a strengthened NACA. In April 1958, and as a direct result of the NACA vision, Eisenhower presented detailed plans to Congress that identified the creation of a national space organization that was initially called the National Aeronautical and Space Agency but was later changed to the National Aeronautics and Space Administration



NASA Photo

Vanguard TV3 explodes after a malfunction in its first stage causing the vehicle to lose thrust shortly after launch.



NASA Photo

Explorer 1 is launched on top of the Juno I launch vehicle from Launch Complex 26 at Cape Canaveral.



NASA Photo

NACA's Special Committee on Space Technology, called the Stever Committee after its chairman, Guyford Stever, meets at Lewis Laboratory, May 26, 1958. Left to right, Edward R. Sharp; Colonel Norman C. Appold, U.S. Air Force; Abraham Hyatt; Hendrik W Bode; W. Randolph Lovelace II; S. K Hoffman, General Manager, Rocketdyne Division, North American Aviation; Milton U. Clauser; H. Julian Allen; Robert R. Gilruth, Assistant Director, NACA Langley, J. R. Dempsey; Carl B. Palmer; H. Guyford Stever, Chairman; Hugh L. Dryden; Dale R. Corson; Abe Silverstein; and Wernher von Braun, Director, Development Operations Division, Army Ballistic Missile Agency.

(NASA). For the next two months while organizational planning for the proposed changes were in work, the Congress continued to evaluate the impact of the proposed changes.

NASA Assumes Control of Civilian Space Activity

In July 1958, Lyndon B. Johnson, the Senate majority leader, pushed the National Aeronautics and Space Act through Congress and President Eisenhower established the National Aeronautics and Space Administration under its authority. The long term national objectives of the United States in aeronautical and space activities were identified in general terms in the enabling legislation that established NASA. In operational terms, those objectives were to explore and utilize the earth's atmosphere and the area immediately outside of it for peaceful and scientific purposes while at the same time providing research support to the Department of Defense (DOD). In addition to creating NASA, the Space Act abolished the National Advisory Committee for Aeronautics, effective October 1, 1958. It also created the Advanced Research Projects Agency (ARPA), a civilian-military advisory panel, based thereafter at Vandenberg Air Force Base. This agency was given the responsibility to develop space technology expressly for military applications and to advise and coordinate the U.S. military uses of space. On-going U.S. Army and U.S. Air Force research activities and many of ARPA's previously identified space programs were slowly transitioned to the NASA (lunar probe program, X-15, Dyna Soar, etc.). When NASA absorbed the National Advisory Committee for Aeronautics it became the U.S. government agency responsible for the advancement of space flight related technologies. This organizational change added the development of additional space technology to the existing NACA mission and dictated a new set of goals and objectives for the agency. Prior to enactment of this legislation, the responsibility for space exploration had been primarily a military venture in line with the Soviet model that had launched the first orbital satellite. The space related activity of NACA in the Sputnik era was a natural outgrowth of its basic aeronautical research and its structures and propulsion work in support of aircraft and missile related projects. The new Space Act directed that all armed forces non-military space activities be transferred to the new civilian space agency. When it became operational on October 1, 1958, NASA had absorbed the 46 year old NACA organization intact: it's 8000 employees, an annual budget of $100 million, major research laboratories, i.e., Langley Research Center (LaRC), Ames Research Center (ARC) and Lewis Flight Propulsion Laboratory (LFPL) and two small test ranges, Wallops Island (Virginia) and the Muroc test range. In 1958, when NASA was created and the existing NACA labs were renamed as centers, Muroc became the NASA Flight Research Center (FRC) at Edwards Air Force Base. On October 7, 1958, T. Keith Glennan, the first administrator of NASA, approved the development of the Mercury spacecraft, which was designed to carry a single astronaut and was established in an effort to learn if and how humans would survive in a space environment. In January 1959, McDonnell Aircraft Company was chosen by NASA to be the prime contractor for the Mercury capsule. The objectives of Project Mercury were threefold: to place a manned spacecraft into orbit around the earth, to observe human performance under such conditions and to recover the human and spacecraft successfully. The Stever "Special Committee on Space Technology" study results gave the NASA a "jump start" on its initial space program planning effort and provided them with badly needed guidance at a crucial time in their history. Exploration of the solar system in 1958 was seen as an arena in which both man and machines would ultimately be required and an area in which the potential use of automation was not yet truly understood. The original Space Task Group (STG) was a small working group of

NASA engineers located at LaRC that was initially established in late November 1958 to resolve technical issues on the Mercury Project. Due to physical space limitations the STG operated until 1962 from LaRC while being managed from the Goddard Space Flight Center (GSFC). In 1961, plans were in place to establish the Apollo spacecraft Project Office in Houston. From its beginning, the Director of the STG was Robert Gilruth, an aviation and space pioneer. As the manned spacecraft programs were expanded, the STG was assigned an increasingly larger technical management role over each of America's manned spacecraft programs. In 1959, with an expected expansion of manned spacecraft programs imminent, the STG added 32 engineers to its roles from Canada. This team of NASA engineers, many of whom became very familiar to us over the years, carried the Mercury, Gemini and Apollo Programs for NASA through the early 1960s. They formed the nucleus of an Advanced Vehicle Design Team that studied, evaluated and recommended advanced spacecraft design approaches. Shortly afterwards, they assumed the responsibility for immediate and long range program planning. In December 1958, NASA was given control of all Jet Propulsion Laboratory (JPL) space oriented activities at their facility operated by Caltech in Pasadena, California. Early in 1959, the Vanguard, a Naval Research Laboratory Project at the Beltsville Space Center in Maryland, was transferred to NASA and the space center was re-named the Goddard Space Flight Center. In early 1959, the U.S. Army team of former V-2 rocket experts, located in Huntsville and working under the direction of Wernher von Braun, were also transferred to NASA. Over the next several years, this group worked feverishly to develop the plans and designs for the hardware and software that eventually led to the Saturn series of rockets launched in the 1960s. From a military standpoint the Cold War had been expanded overnight into both a nuclear "Arms Race" and a "Space Race", causing the developmental pace of both intermediate and long-range missile programs to be further accelerated. On the west coast, the U.S. Air Force responded immediately to the "Sputnik Crisis" as it was called. The Soviet Sputnik operation had clear military implications and the Air Force pushed its missile program into high gear. By the end of 1958, what had been Cooke Army Base in California two years earlier became Vandenberg Air Force Base. As Cold War tensions continued to increase, larger missile systems were developed and successfully launched from Cape Canaveral, i.e., Atlas, Thor, Titan and Minuteman, etc. The first successful flight of a highly instrumented Atlas full range missile was launched from Cape Canaveral in late November 1958. Within a year after its creation, NASA began looking at potential follow-on programs to Project Mercury, the initial human spaceflight effort. In August 1959, a Thor Able missile was used to successfully launch Explorer 6, the first U.S. satellite to successfully transmit pictures of the earth taken from earth orbit. In late 1959, the first Atlas D ICBM was launched from Vandenberg and ballistic missiles were deployed operationally to "hot spots" around the world. As a consequence of the new priorities that had been established, Cape Canaveral became a hot bed of launch activity well into the 1960s. Many of us remember when the departure of a missile tracking ship from Canaveral harbor and/or the arrival of a Polaris or Poseidon submarine at the harbor suggested that a military launch may be imminent. In those days we were awakened by "surprise" successful launches and/or spectacular failures, both of which were newsworthy.

The First Two Years of NASA Management

The two-year transitional period from the NACA organization to the new NASA organization was one that dictated a clarification of its goals and objectives, a definition of its governmental interfaces, a clarification of its authority and responsibility and confirmation that it had the support of the entire country. It dictated an evaluation and re-structure of their organization, and an extensive build-up of their facilities, technical capability and supporting manpower. Essential to the needs of NASA was the development and implementation of near term and long-range project plans and schedules consistent with the goals and objectives of the National Space Act.

New NASA Responsibilities and Objectives – NASA recognized early on that it was going to become a much different organization than NACA had been before them. It was about to become an operational as well as a research organization. They would not only design and build launch vehicles, spacecraft and satellites but they would also test, operate and launch them, control and track them in-flight, acquire data from them and interpret that data and recover them. To support the various space programs would require tracking sites in many countries around the world, and the construction of ground system assembly and test facilities. It would require specialized antennae, telemetry equipment, computers, radio and landline communications capability, etc. In addition, they would be required to do the greater part of their work by contract rather than in house as NACA had done previously. To support the space programs, it was necessary for them to develop a far more sophisticated contracting operation than NACA had previously required. Throughout the first two years, the primary focus of its management team was directed toward development of an organization that clearly identified and understood its role in the national space picture. They searched colleges and small and large corporations throughout the country, and beyond to supplement their existing sources of manpower. Many space-minded specialists were drawn into NASA, attracted by the exciting new possibilities available to them. Foremost in the minds of NASA, at the time, was the need for continued successful performance of those tasks previously being worked at NACA, the detailed implementation of the recently identified manned Mercury Project and the newly assigned specific responsibilities dictated by the National Space Act.

Research Steering Committee for Manned Flight – Within less than a year after its creation, NASA began looking at follow-on programs to Project Mercury. In early April 1959, NASA Headquarters called for nine key representatives from its various field centers to serve as members of a Research Steering Committee for Manned Space Flight headed by Harry Goett, later to become the Director of GSFC. At the first meeting that took place in late May 1959, in Washington, D.C., representatives were in attendance from each of the various NASA centers and from JPL, and the High Speed Flight Station (HSFS) at Edwards Air Force Base. The primary purpose of the committee was to take a long-term look at man-in-space activities that would eventually lead to recommendations for supporting research programs. It was felt that the committee could help put more objectiveness into NASA space research by stressing the overall tasks to be performed and concepts to be explored. During the meeting, each representative provided an overview of the on-going space related research activities at

their respective sites. They also provided their thoughts on the need for near term scientific exploration and for human space flight within the universe. From the outset, the committee members discussed the U.S. near-term and long-range space oriented goals, objectives, research needs and target milestone dates for each projected launch and mission activity. A fallout of the discussion was the identification of the various types of supporting research that would be required to satisfy each immediate space oriented goal or objective and the organization that could best provide that capability. With that knowledge, recommendations for change and/or expansion of flight vehicle and ground system goals, objectives and schedule milestones were established and an initial "cut" at a national long-range space plan was developed. George Low, in charge of human spaceflight at NASA Headquarters at that time, set the tone for the meeting and for subsequent meetings by recommending that a lunar landing be established as NASA's long-term goal, with an orbiting space station and circumlunar flight as intermediate steps to that goal. He was supported by Max Faget (an engineer and designer from the Space Task Group of the Langley Research Center), and Bruce Lundin (representing the Lewis Research Center), but the concurrence of the entire committee was not initially obtained. During the last half of 1959, the Research Steering Committee met on numerous occasions to complete their initial development of a Long Range Plan for space launches that included target milestone timeframes. The initial plan included an agreement on who would provide the supporting research necessary to satisfy the immediate space oriented goals and objectives. After much debate the committee reached a consensus on both the initial priority of the planned goals and objectives and on a preliminary 1959 Long Range Program Plan for the manned space flight program. Significant among their decisions was one that established a lunar landing as the NASA long-term goal.

Early NASA/DOD Space Vehicle Launches – With the support of the DOD and its applicable branches of the military, NASA began to launch space vehicles within months of its creation. The intent of each launch was to develop an understanding of the immediate environment of the earth, the moon and of the potential operational hazards to be encountered while operating in that environment. Follow-on launches were focused on the topography and composition of the lunar surface and on the potential problems we might encounter should we attempt to land there. These initial unmanned launch activities were constrained by a moderate budget, an undeveloped propulsive system launch capability, newly identified and developed hardware, a work force with little experience and the constrained pace of a new NASA and contractor leadership. In the early years of space activity, the complexity of the flight vehicle and ground hardware involved in the design, development, manufacture, test, and launch operations became more complex and the individual projects became more prone to failure. By December 1959, the United States had attempted 37 satellite launches and less than one-third attained orbit. In some cases, the reliability of electrical, fluid, mechanism, and structural hardware intimate to the design of launch vehicles and/or satellites were found to be deficient. A new order of reliability in design, manufacturing, assembly and test processes had to be instilled in the minds of the managers, designers and those working directly with the hardware. As time progressed, a family of both existing and new, more powerful launch vehicles and more intricate satellites were identified to support the various types of unmanned missions to be flown. In addition to the use of the Thor, Atlas and Redstone launch vehicles in the early days, Scout, Centaur, and Saturn vehicles were developed to satisfy unique mission requirements. As time passed, the need for an increased emphasis on development of "state of the art" technologies (i.e., electronics, inertial navigation, automation and computers, robotics, non-flammable materials, high strength metals, etc.) became apparent and the country reacted. At the same time the Space Race sparked unprecedented increases in spending on education and pure research that accelerated numerous scientific advancements that eventually led to technological spin-offs in virtually all fields of endeavor.

NASA Long Range Program Plan 1960-1970

NASA Mission Target Dates Established 1960	
1960	• First launching of a Meteorological Satellite • First launching of a Passive Relector Communications Satellite • First launching of a Scout vehicle • First launching of a Thor-Delta vehicle • First launching of an Atlas-Agena-B vehicle (by the Department of Defense) • First suborbital flight of an astronaut
1961	• First launching of a lunar impact vehicle
1961-1962	• Attainment of manned space flight, Project Mercury
1962	• First launching to the vicinity of Venus and/or Mars
1963	• First launching of two-stage Saturn vehicle
1963-1964	• First launching of unmanned vehicle for controlled landing on the moon • First launching Orbiting Astronomical and Radio Astronomy Observatory
1964	• First launching of unmanned lunar circumnavigation and return to earth vehicle • First reconnaissance of mars and/or Venus by an unmanned vehicle
1965-1967	• First launching in a program leading to manned circumlunar flight and to a near-earth space station
Beyond 1970	• Manned flight to the moon...

About the Author: During his 34 years with NAA/Rockwell, Bill served on the Apollo, Space Shuttle and Space Station programs in a supervisory or management position. Half of that time was dedicated to launch operation on Apollo and Space Shuttle at KSC. He has endeared himself to our readers, especially those that served at KSC. They marvel at his ability to recall the details of events that occurred over 40 years ago. We are very proud to have him aboard!

North American Aviation "Forgotten" at Air Force Museum

by Ed Rusinek

Several weeks ago, I received a phone call from Columbus Retiree and Silver Eagle Nolan Leatherman regarding a visit he just made to the USAF Museum at Wright-Patterson Air Force Base, for the 70th Reunion of the Tokyo Raiders with over 20 B-25s on the tarmac and a B-25 flyover. From his many visits to the museum, he noted the many North American Aviation airplanes from the O-47 to the B-70 and B-1 on handsome display and properly identified as NAA aircraft. However, when he approached the main museum building, he noticed two walls along the walk with plaques representing various aircraft and aerospace companies. There was one for Boeing and one for Rockwell but *none* for *North American Aviation*! It seems that North American Aviation, Inc. had been *"forgotten"*. He called to say, "Something should be done about this!" I asked, "What did you do at Columbus?" He answered, "I was in Contracts". I responded, "Is there a better man than you to represent us?" In true NAA Spirit, he said, "I'll do it!" Nolan Leatherman is now Our Man in Ohio!

Nolan and two friends from NAA/Columbus met with representatives of the Air Force Museum Foundation, the group authorized to maintain the museum and its accompanying park. There is no more room for a plaque to be added to the two walls. It was suggested that we provide a black granite memorial bench to be placed along the walk running through the park. Nolan was provided a twenty-page packet on how to apply for permission from the Museum, suggested area granite contractors available, mistakes to avoid and dedication ceremonies possible. Nolan has contacted the recommended contractor and obtained the prices for the bench. It is approximately $6,000.00 and will take about five months to complete. He has also provided some photos from the museum. The cost is high but not unattainable. The Bulletin has tapped out most of the funds contributed over the years to endow the NAA Achievement Awards at the USAF Academy for perpetuity. Hence, we must turn to our friends and subscribers to help in this endeavor, including those in the Silent Majority. To truly include all retirees, we propose the NAA Logo in the center surrounded by the names of all Divisions.

Just as we were going to press, we received a phone call from the Museum to stop all action on the bench because the Museum Foundation suddenly realized that we were the only company seeking a bench. All the existing benches were in honor of an individual or a squadron. The fact that we were not an active company seeking a contract from the USAF but proud retirees of a company that disappeared 50 years ago seemed to have no bearing on the risen issue.







Space Walk of Fame Museum

by John Tribe



The U.S. Space Walk of Fame Foundation works to preserve the history of the U.S. Space Program through its Mercury, Gemini, Apollo and Shuttle Monuments located in Titusville's Space View Park, Florida and the Space Walk of Fame Museum located nearby. It is a non-profit organization.

The Foundation has completed three monuments to date – Mercury, Gemini and Apollo – and the fourth, the Space Shuttle, is in work. As part of each monument the names of program participants are either part of the monument or on separate pylons, and these names continue to be added as new subscriptions come in. These are impressive structures and photographs of the existing monuments, along with the depiction of what the Shuttle monument will look like, are shown. In addition there is a separate monument to those who have lost their lives in Cape and KSC accidents since 1950, including the Rockwell technicians who died in the Columbia GN2 accident of 1981.

The U.S. Space Walk of Fame also operates a Space Museum on Main Street, Titusville, adjacent to the monuments. Over the years the Foundation has become a collector of a huge assortment of space memorabilia and displays much of this in its Museum. Volunteers – in most part retirees from the Cape or KSC – man the Museum. It also includes a gift shop for the purchase of space souvenirs and is a focal point for tourists who appreciate the free visit and the offer of free conducted tours.



Membership of the SWoF can be purchased on the website or mailing address below and I would encourage anyone who spent time working on NAA/Rockwell manned programs from Mercury through Shuttle to help this dedicated operation by purchasing a membership or at the least an engraving for the applicable monument(s). Preserve a permanent record of your participation in these momentous programs within sight of where they were launched.

While honoring and recognizing all of America's space programs and heroes the Foundation agrees with Alan Shepard when on May 13, 1996, he stated: *"We need to remember the people who made it possible, so little is said of them".*

For full information on the Foundation and how to purchase Memberships and Monument plaques go to:

http://www.spacewalkoffame.com/about-us/history/

Or write to:
U.S. Walk of Fame Foundation,
P.O. Box 1989
Titusville, FL 32781-1989

E-mail: info@spacewalkoffame.com
Phone: (321) 264-0434





"Twenty years from now you will be more disappointed by the things that you didn't do than by the ones you did do. So throw off the bowlines. Sail away from the safe harbor. Catch the trade winds in your sails. Explore. Dream. Discover."

— Mark Twain

Where Do We Go From Here?

by Larry Korb

The Magic Island

Have you ever thought of that perfect vacation—the one where you can relax in the Sun, away from the radio and TV, the traffic, the smog, the congestion on the roads, and the politicians? There is an island about a three-day travel time away that, in many respects, is Utopia. There are:

- No flies, bugs, rats, mice, cockroaches, alligators, or snakes,
- Cloudless skies,
- No bacteria, germs, fungi, or viruses. You will never get sick from the environment,
- No noisy neighbors, no traffic, nor traffic jams,
- No crime, nor gangs, nor drugs,
- No airborne pollution,
- No hurricanes, winds, floods, tsunamis, tornadoes, or typhoons; only an occasional earthquake that is so faint you could not detect it,
- No active volcanoes,
- No polluted lakes, rivers, nor seashores,
- No high humidity, and,
- An absolutely fantastic view.

By now you may have guessed, I am talking about the Moon. We had a program to colonize the Moon, the Constellation Program. It has been cancelled, just as the Space Shuttle Program has. NASA can no longer put a man into orbit, much less go to the Moon. So why did we want to set up a colony? Are we "lunatics"? Setting up a colony is doable, but is it desirable? You decide.

The reason the Moon has no bugs, or mice, or rats, or cockroaches, etc., is because it has no life. For life to exist, as we know it, requires that plants make food from carbon dioxide and water (carbohydrates and fats). Protein is made by adding nitrogen, not directly from the air, but from nitrogen-fixing soil bacteria. But the Moon has essentially no atmosphere, no nitrogen, no CO_2, and no water (except small quantities in -367 °F ice deposits at the poles). So without plants, there are no animals, germs, fungi, or viruses. Why does the Moon have no atmosphere? It is because its gravity is so weak that the air molecules escaped into outer space.

On the Earth, we have an atmosphere consisting of nitrogen, oxygen, argon, and a few trace gases. One out of every 2,553 molecules of air is a molecule of carbon dioxide (CO_2). While CO_2 is a trace gas, it is sufficient to feed all of the plants on the Earth. God, in his infinite wisdom, made the water molecule about half the weight of the oxygen and nitrogen molecules. This allows the water to evaporate and rise to the upper atmosphere, where it condenses, giving up heat to outer space, and lowering the Earth's temperature. This water returns to almost every area as rain (God's sprinkler can), allowing plants to grow and produce food. (In case you are curious, the atmosphere at sea level has 440×10^{18} molecules per cubic inch. Contrast that with the fact that there are 350×10^{18} gallons of water in all of the oceans.)

Without an atmosphere on the Moon, we must bring our own food. Our atmosphere also contains ~20% oxygen. It is this oxygen that allows us to metabolize the food, generating the energy we need to fight the gravity. While we live off the land in an environment of ~200,000 parts per million oxygen, fish live in water containing 5 to 8 parts per million oxygen. Of course, they do not have to fight gravity, for they can adjust their depth by adding air to their bladders and float.

The Earth offers not only the advantage of streams, rivers, lakes, and oceans to support life, but it can conserve and regulate heat more efficiently. It has greenhouse gases. These add ~59 °F to the Earth's temperatures. Without them, the Earth would average 0 °F, or 32 degrees Fahrenheit below freezing. Diatomic molecules such as nitrogen and oxygen cannot absorb heat, but molecules with three or more atoms readily absorb heat from the Earth, as well as blocking heat leaving the Earth. The most effective greenhouse gas, the one accounting for over 95% of the greenhouse effect is H_2O, while CO_2 comes in at about 3-4% of this 59 °F greenhouse gas heating. Clouds in the sky, formed by water vapor will cool the Earth, blocking significant solar radiation, yet, at night time, they act as the insulation to prevent major losses of heat to empty space.

A day on the Moon is ~14 Earth days. As a result, heat pours in during the daytime and out at the nighttime. The temperature at the lunar equator at mid-day hits 253 °F, hotter than is needed to boil water on Earth, and at nighttime reaches -250 °F. Oh, for an atmosphere with greenhouse gases!

Other significant factors of the Earth's atmosphere are that micrometeorites are burned up during entry. This does not happen on the Moon and represents a significant hazard. Second, we have an ozone (O_3) layer protecting us from ultraviolet radiation. The ozone layer extends up to 45 miles altitude, but the highest concentration is at about 18.5 miles altitude at the equator. The ozone within this atmospheric region exists as 1 to 10 parts per million. If all of the ozone layer were in one single layer at 100% concentration, and atmospheric pressure of 14.7 psi, the layer would only be ⅛-inch thick. Yet this ozone concentration is essential to blocking out the ultraviolet wave lengths in the 240-290 nanometer range. This is a deadly range and the ozone layer lets in less than 1 part in 10^{30}.

But there are two positives about this island in the sky. When you land, you immediately lose 84% of your weight. Jenny Craig can't match that!

Second, it has the most beautiful view in the solar system. You can watch the Earth spin on its axis and the Earth is 4 times the diameter of the Moon at that distance. Incidentally, it is the Moon which restrains our axis of rotation to between 21.5 and 24.5 degrees. Without it, the Earth's axis would wander. Without an atmosphere, the Moon's surface does not weather or change. Temperature extremes also don't change. The Moon is the same as it has been for billions of years. Scientists believe the Moon played a major part in the development of life on the Earth, particularly by tidal action. This caused the mixing of essential molecules and water. The Earth used to rotate every nine hours instead of every 24 hours. Over the period of 4.3 billion years, the tides on Earth, caused by the Moon, slowed down the Earth's rotation. To conserve the angular momentum of the Earth-Moon system, the Moon must move away from the Earth at the rate of 1.5 inches per year. The tides presently slow down the Earth's rotation by 2 milliseconds per hundred years. The height of the tides is a function of the distance from the Earth to the Moon, and the tide increases by the inverse cube of the distance. If the Moon were ⅓ as far away, the average tides would be 27 times as high. If the Moon started out at 11,500 miles from the center of the Earth, tidal forces would have broken the Moon into pieces and we would have Saturn-like rings.

Setting up a colony on the Moon would require a source of electricity, probably by using solar cells. The original plan was for a colony near the South Lunar Pole where frozen water exists. The Moon is covered with fine particles of glassy shards, very abrasive, which can cut space suits. Unlike sand on the beach, this glass has never weathered and become rounded. Lunar transportation can be powered by batteries, or maybe solar cells, for without oxygen, gasoline is useless.

How We Lost the Manned Space Program

Bob Thompson, NASA Shuttle Program Manager for 11 years, points out in a recent paper (*The Space Shuttle – My Observations*) that the Bush administration, following the *Columbia* accident, decided to phase out the Shuttle. When Dr. Michael Griffin became the NASA Administrator, he quickly proclaimed that "the Space Shuttle and Space Station were a mistake" and he was here to correct that mistake. There was no technical reason ever studied or advanced that the Space Shuttle should be phased out.

The first erroneous public perception was that the Space Shuttle was "getting old". NASA never properly addressed that point to dispel this misperception. The Shuttle's age was not a technical factor. The DC-3 has been flying for up to 77 years and the B-52 for 57 years. The Shuttle could have also, because of the 11,000+ updates to its design over its life that kept it within the state-of-the-art. The second wrong public perception was that the Shuttle was dangerous and risky. If that were the case, how did we have 88 consecutive flights without a vehicle loss? If, when the *Columbia* failed, NASA had stood up and said, "We were negligent. We could have saved the *Columbia* and its crew if we had been diligent and not over confident." (See the winter 2011 issue of the North American Aviation Retirees Bulletin article: *"The Space Shuttle Challenges and Legacy: An Engineer's View"*)

In the Bush "Vision for Space Exploration" announcement, NASA would change emphasis for a Lunar/Mars program called the Constellation, which employed an Orion 4-man spacecraft. The mission was to go back to the Moon with the Orion (Apollo on steroids), which was a copy of the basic Apollo Spacecraft configuration. NASA would set up a lunar base or colony near the Lunar South Pole as a jumping off point for a Mars Mission. Bob stated that the (Constellation) program expired due to "poor engineering, poor planning, poor execution, and the lack of funding support". The Obama administration cancelled the Constellation Program. The Obama shift was to let the commercial industry build lower-earth-orbit (LEO) spacecraft and boosters for NASA, initially funded largely by NASA grants.

Space Agencies of Other Countries

There are some 73 Space Agencies throughout the world. One agency, the European Space Agency (ESA), represents 20 European countries. Of these, nine have budgets of over one billion dollars annually, (NASA, ESA, Russia, France, Japan, Germany, India, China, and Italy). Another six have annual budgets of 250 to 500 million dollars. Even Mexico has a Space Agency with an annual budget. Sixty-six Space Agencies operate satellites and 26 of them have a group of astronauts in training. Nine space agencies, including the 20-country European Space Agency, have multiple launch capabilities.

Only China and the two Russian Space Agencies have manned launch capabilities. The U.S. lost its manned space launch capability in 2011 with the Shuttle cancellation, followed by the tear-down of its launch pads.

Lunar Probes – Past and Present

From 1958 through 1990 the Americans and Russians made the only lunar probes and landings.

NASA – NASA had 24 successful launches including 9 planned manned Moon visits, and 6 manned Moon landings. To this list I included Apollo 13 as a partial success. There were 13 outright failures and 3 other partial successes.

USSR – The Russians, on the other hand, had 22 successful Lunar probes and 59 failures, but never landed a man on the Moon.

There is still a fascination for the Moon. The following is a summary of recent activities.

Japanese (ISAS) – Since 1990, the Japanese have launched two successful fly-bys which engaged in multiple re-approaches to the Moon (10 and 14 times), and a successful lunar orbiter. They also launched two fly-bys to get a gravity assist on a planned mission to Mars in 1998.

Japanese (JAXA) – In October 2007, the Japanese sent up a radio relay satellite and sent two successful satellites that orbited the Moon, one of which is still in orbit. One was for surveying the mineralogical, geographic, magnetic, and gravity characteristics of the Moon. It was terminated in February 2009. A second satellite is to provide for very long baseline interferometry for astronomical observations. It is still in orbit.

European Space Agency (ESA) – In November 2004, ESA sent up a successful orbiter for geological studies and intentionally impacted the Moon at the end of its mission in September 2006.

China (CNSA) – In November 2007, China sent up a lunar orbiter for geological observations and 3-D lunar mapping. It remained in orbit until March 1, 2009. In October 2010, CNSA sent up another lunar orbiter to capture high-resolution images for a soft landing site for a future spacecraft, the Chang'e 3, which would measure and analyze the content of the lunar surface.

India (ISRO) – In November 2008, India sent up two lunar probes: one was an orbiter for 3-D high resolution mapping of the lunar surface and to perform a spectral analysis of the lunar surface composition; the other was an impactor for testing soft landings and scientific observations of the Moon at close range.

NASA – After a long hiatus (11 years), NASA revisited the Moon. In February 1994, NASA put up a lunar orbiter, *Clementine*, for lunar and earth observation and component testing. A planned flyby of the asteroid, Geographos, in the same mission, however, was unsuccessful.

In January 1998, NASA put up an orbiter, *Lunar Prospector*, for lunar surface mapping. It was sent to impact the lunar South Pole in July 1999, to test for the liberation of water. Ten years later, on October 2009, the *LCROSS* spacecraft was another impactor for determining trace water from the Moon's polar surfaces. It was successful in determining the presence of water, as ice, at the lunar South Pole.

Two orbiters, *ARTEMIS P1* and *ARTEMIS P2*, were sent up in July 2011, to study the effect of the solar wind on the lunar surface. In December 2011, an orbiter called *GRAIL A* was sent up to map the Moon's gravitational field. It was followed in January 2012, with *GRAIL B*, to do similar gravitational mapping.

Future Lunar Probes

NASA – NASA plans to send two lunar probes: an orbiter in January 2013, called *LADEE* (no mission revealed) and *MoonRise* in October 2016, which will land on the surface and return a sample to Earth.

China (CSNA) – China expects to send Chang'e 3 to the Moon in 2013 with an orbiter and a soft lander and land rover. This will be followed by Chang'e 4 in 2017. It will orbit, then extract and send back a sample of the lunar surface.

India/Russia (ISRO) and the *Russian Federal Space Agency* are involved in a joint venture to send an orbiter and a lunar rover, imaging and searching for helium-3 (tritium) and ice on the surface of the Moon. Helium-3 could provide unusually high energy levels if a fusion reactor is ever perfected. The lunar surface would be mined. Theoretically, ice could be decomposed by the energy of solar cells to make liquid hydrogen and liquid oxygen propellants for Mars missions.

Private American Missions (GLPX) – Google is offering an *X-PRIZE* of 30 million dollars to place a robot on the Moon's surface that transmits high definition video images and data back to Earth from its landing site and from 500 meters away. The prize has excited competition of some 17 companies. The *X-PRIZE* is available until 2015. Two robotic technology companies, Moon Transit of Mountain View, California, and Astrobotics Technology have announced 2013 launch dates. It should be interesting. There is some interest in platinum group metals deposited on the lunar surface due to eons of asteroid bombardment. The ultimate goal of some participants is for lunar mining.

Future Manned Lunar flights

This is a world of uncertainty, especially with the international economic crisis. Japan, India, the European Space Agency, and China have expressed a manned lunar landing as a goal. The Chinese, who have sent up a Spacelab and recently docked to it, are leaders in the field. A manned lunar landing and return would be a tremendous prestige symbol for this country and their technology. If China, Japan, ESA, and India are getting close, the Russians would not like to be out-done and could secretly be preparing for this, for they have manned spacecraft launching facilities.

NASA's Future Manned Space Efforts

With the cancellation of the Constellation Program in 2010, NASA did not scrap the Orion 4-man spacecraft. The Aries 1 and Aries 5 boosters were cancelled. Congress directed NASA to:

1. Continue supporting non-government space programs to develop propulsion and vehicles for the Space Station servicing, including a man-rated capsule, to be kick-started in 2012 with 850 million dollars,
2. Develop a new heavy-lift rocket at a budget of 1.8 billion dollars this year, capable of sending men to asteroids and Mars,
3. Spend no less than 581.7 million dollars for 2012 for "manned Mars Exploration" efforts,
4. Prepare to land a manned vehicle on an asteroid by 2025,
5. Develop a Multi-Purpose Crew Vehicle (MPCV) on a budget of one billion dollars per year. It will be a modification of the Orion. The first test flight is in 2013 or 2014.
6. Return expenditures to the 2010 budget levels for the next 5 years, and,
7. Cut operations previously devoted to the Shuttle and Space Station budget by 1.16 billion dollars to 4.3 billion dollars. (This will be mostly realized by the retirement of the Shuttles.)

The 2012 NASA budget is presently $17.8 billion dollars.

Heavy-lift Launch Vehicle-Space Launch System (SLS)

NASA is presently leaving the development of Low Earth Orbit (LEO) boosters and spacecraft to commercial industry. NASA will develop a new series of chemically propelled boosters for deep space and a Mars mission. This is an attempt to equal, and then surpass the Saturn V booster system used for lunar exploration.

The initial vehicles will be 200 feet high and 27.5 feet in diameter. The Core Stage will store liquid hydrogen and liquid oxygen and be accompanied by 2 solid rocket boosters. The first few flights will use the Rocketdyne RS-25 engines used on the Space Shuttle, since 16 of these are in stores and 5 are needed per launch. The first launch in 2017 will have a 77-ton payload (about 10% more than the Saturn V Booster and and roughly 3 times as large as current boosters). As it evolves, it will morph into a lift capability of 143 tons. Boeing is the prime contractor for the Core Stage. The J-2X upper stage rocket engine for future stages is already under test at Stennis Spacecraft Center. The final configuration of the booster will be over 400 feet tall and have a thrust of 9.2 million pounds, or about 20% more than the Saturn SV.

Manned Landing on an Asteroid

Landing a man on an asteroid is within the state-of-the-art.

Comets – Some 12 comet encounters have been made by NASA, the Japanese Space Agency, ISAS, and the European Space Agency, ESA, starting in 1986. NASA returned Comet dust to Earth from their *Stardust* probe of comets Wild 2 and 4P/Tempel 1. On July 4, 2006 they sent a 360-pound copper impactor into comet 9P/Tempel 1 at 7.2 miles per hour.

Asteroids – NASA has intercepted or flown by 5 asteroids. The *NEAR* probe actually landed on asteroid 433 EROS at about 10 feet per second. This was not a mission goal, but a late decision. The NASA *Deep Space* probe used a xenon ion engine. The NASA *Dawn* probe flew by asteroid 4Vesta and will intercept the dwarf planet, Ceres, in August 2014 and send an orbiter around it. It, too, uses a xenon ion engine.

The ESA has, to date, encountered one asteroid on their *Rosetta* and *Philae* probe. By 2014 they hope to drop the lander, *Philae*, on the asteroid Lutetia.

The Japanese *Hayabusa* probe went to asteroid Itokawa in 2005, gathering asteroid dust samples and returning them to Japan for analysis.

The NASA future asteroid program is looking for a good candidate asteroid, preferable a near-Earth asteroid which could be reached by astronauts within a few months of launch. Only two asteroids will be potential candidates based on the guidelines set up by NASA: one in 2020 and one is 2025. In 2020, a 197-foot long asteroid known as 2009 OS5 is a target. NASA is looking for a round trip of 170-180 days. In 2025, the asteroid called 1999 AO10, a 65-foot rock, is a potential target. Just 17 asteroids, reachable by humans, are larger than 164 feet and only 15 of these are within the 180-day round trip limit.

Why is landing on an Asteroid important? It might save the world. Professor Peter Ward and Professor Donald Brownlee

cite that the extinction of the dinosaurs and 65% of the living species resulted from an asteroid or comet impact in the Caribbean Sea off the Yucatan Peninsula of Mexico. Any asteroid of 6-10 miles in diameter striking the Earth would have *10,000 times the energy of the entire world's arsenal of atomic weapons* and would result in an extended winter for more than a decade, and mass extinction.

We may have to change the path of an asteroid in the near future and probably have the technology to nudge it into a slightly different trajectory.

Manned Visit to Mars

There have been 14 *major* manned Mars mission studies in the last 24 years. No attempt will be made to review these, but some of the ideas advanced are discussed below in the categories of zero gravity, propulsion, and radiation protection.

General Facts – If astronauts thought the Moon was desolate, Mars is every bit as desolate. A day on Mars is some 24 hours and 39.6 minutes, nearly the same as on the Earth. Mars is 49 million miles farther from the Sun than the Earth, hence it gets only 43% as much energy from the Sun and the Sun's diameter from Mars is 66% as large as that which we see from Earth. A Martian year is 687 Earth days. Mars mass is 10.7% of the Earth's mass and its diameter is 4,200 miles, or 53% of the Earth's diameter.

Mars has 2 tiny moons, Phobos, measuring 11 x 17 miles and Deimos, measuring 7 x 9 miles. Mars is tilted on its axis at 25 degrees from its plane of rotation while the Earth's tilt is 23.45 degrees. Its surface gravity is 38% of that on the Earth. Because it has no significant moons to stabilize its tilt; the tilt wanders as much as 45 degrees over a period of time.

Temperature – The average surface temperature on Mars is -82 °F or 114 degrees below freezing. The average temperature of the Earth is 59 °F, thanks to greenhouse gases. The Viking Landers, measuring Martian temperatures five feet above the surface, recorded temperatures of +1 °F to -178 °F. The polar caps drop to -225 °F. Daily swings of 100 °F are normal. The warmest soil recorded reached +81 °F, but this is hardly the environment in which one can grow plants.

Atmosphere – The atmosphere of Mars is 95.34% carbon dioxide, 2.7% nitrogen, 1.6% argon and 0.13% oxygen. It contains traces of carbon monoxide (0.07%) and water vapor (0.03%). The water vapor is less than one hundredth of that recorded on Earth. Atmospheric pressure is one 170th of that on Earth. Naturally, pressure increases in deep canyons (almost double) and decreases with height. At the summit of Olympus Mons, 88,600 feet, the pressure is 5% of that at the surface. Traces of the atmosphere extend up to 120 miles. Because the Martian atmosphere is composed of CO_2, atomic weight = 44, while the Earth's atmosphere is nitrogen and oxygen, average atomic weight = 29, there are 67% fewer atoms per the same pressure levels. On the Earth, the CO_2 is 391.6 parts per million or one molecule in 2,553 molecules. Based on equal volumes of the Earth's atmosphere and Martian atmosphere, there is 10 times the concentration of CO_2 molecules on Mars, certainly enough for plant life. Among the many reasons that there is no plant life, are the temperature and the absence of *liquid water*.

The absence of liquid water is because the pressure is below the triple point on the water phase diagram. It is in the region where solid ice sublimes to water vapor, without liquefying. If that boggles your mind, just think of freeze drying as used on foods in which a reduced pressure is used on frozen food to make the ice sublime out of the food. Although, based on volcanic eruptions, it is estimated enough water was released to cover the entire surface of Mars with 130 feet of water. Water still remains there as ice in the soil and ice under the frozen CO_2 at the poles. Someday we can use this water in our sealed, pressurized module.

The other question is why the atmosphere is so different from that of the Earth. The gravity of Mars is too low to hold on to nitrogen and oxygen molecules in the Martian exosphere. They reach escape velocities. CO_2 is heavy enough to remain. The atmospheric loss is probably acerbated by the solar wind and the lack of a significant magnetosphere to trap the protons of the solar wind coming off the Sun. *There is no Mars planet-wide magnetic field.*

Martian Surface – The Martian surface is covered with regolith (sharp dust particles), similar to that of the Moon. When one walks on the Moon, the dust is stirred up and quickly falls to the ground, for there is essentially no atmosphere. On Mars, because of its atmosphere, there are winds and dust devils. The "sandy" regolith particles are stirred up by the wind when it exceeds a ground speed of greater than 40-50 miles per hour. Because there is no rain, atmospheric dust does not settle as it would on the Earth. Sand deposits seriously compromised solar cells of the Spirit and Opportunity rovers in 2007, necessitating shutdowns of both rovers.

Finally, the Martian poles contain frozen carbon dioxide over a layer of frozen water. The majority of the polar cap is water ice. The depth of the frozen carbon dioxide is 8 feet thick, while the water ice is 1.6-miles thick in the northern polar cap, which is 620 miles in diameter. Both polar caps shrink and re-grow, as the seasons change.

The Mars Mission

What are the greatest challenges to a manned Mars mission? Listed below are those proposed by advocates and opponents, not in any particular order. Are any of these beyond man's ability to overcome? Yes, number 1 is!

1. *Communications* – The distances between Mars and Earth are millions of miles and, though communications travel at the speed of light, it would typically take 40 minutes between a call from Mars until the answer is received. This forces the crew and vehicle to be more self-sufficient, to be able to solve their problems in real time. Further, if an astronaut talks to his wife on the phone during the journey, it may be frustrating for both partners.

2. *Extended Time of Travel* – While one could reach Mars in seven months of travel, the round trip is estimated to be between two and two and a half years long. How boring! The longest Apollo mission lasted nearly 12 days and 14 hours. Some say people cannot stand each other's presence for that period of time, from a psychological standpoint. Obviously the vehicle habitability area must be large. The Russians dispelled this psychological notion in a recent test (MARS-500). On November 4, 2011, the Russians concluded a 520-day simulated Mars lockdown. The cosmonauts performed simulated technical activities on an enclosed simulated Mars surface, some 30-feet long by 18-feet wide, installing and removing scientific instruments and sensors, making chemical measurements, and performing simulated Mars low-gravity walks. They also lived in a total spacecraft environment. Toward the end of the mission, one cosmonaut said that the last two months were "dull". It is not certain whether they had movies, music, or

television to entertain them. Many humans live such a life with little physical outside contact to the world.

3. *Zero Gravity* – In spite of the fact that atronauts on the International Space Station run on a treadmill (in a harness) for a minimum of 2 ½ hours each day, they still encounter the loss of fiber mass and have a decline of over 40% in capacity for physical work after a 6-month stay. A proposal is to rotate the crew module on the way to Mars, creating artificial gravity. The rotation rate can be stepped down to 0.4 g to match the Mars gravity and accustom the astronauts for the Mars visit. On the return trip, the rotation speed can be increased gradually to that of the 1-g gravity on the Earth. One proposed method of doing this involves unwinding a tether attached to the last burned out propulsion stage and using a two body approach where the center of gravity of the two bodies is near the burned out stage. Using the appropriate combination of spin rate and tether length, the appropriate gravity can be attained. Will it work? Why not just use RCS engines to rotate the spacecraft?

4. *Propulsion* – NASA is pursuing the deep-space chemical propulsion system (SLS) mentioned above. The propulsion needs are: Earth escape velocity = 7 miles per second (mps), Hohmann elliptical transfer to Mars orbit = additional 1.4 mps. To return to Earth from Mars, the astronauts need a 5.0 mps and a Hohmann transfer velocity = 1.4 mps. To accomplish this would require about 20 Saturn V rockets or maybe 16 SLS rockets. In my opinion, this will not cut it!

In the 1960s NASA tested a NERVA rocket that used nuclear energy to heat hydrogen and expel it as ions at high velocities. It was totally successful. Today, once you achieve the Earth's escape velocity, you could use an electric-powered ion engine (xenon) to increase your velocity slowly, but continuously. The *Dawn* deep space probe (previously cited), launched in 2007, used such an engine. It had an exhaust velocity six times greater than chemical rockets.

If we had a 15 MW (megawatt) nuclear reactor, utilizing its energy as electricity with 80% efficiency and using xenon ions, we could accelerate a 110-ton spacecraft by 0.0048 meters per second squared or 0.00049 g (g = gravity on Earth). After 5 months, it will give a velocity change of 39 mps, well beyond anything we may need. A potential problem: the trip would use up 46 tons of xenon or 80% of the world's yearly supply. The Europeans, hating atomic energy, propose using electricity from a 100 x 100-foot solar cell array. It will then take ESA five years to deliver a 12-ton payload to Mars, obviously an inefficient choice.

Another approach gaining credibility is to manufacture your return fuel from the Mars atmosphere by the Sabatier process. The starting point is a liquid hydrogen pressure vessel from Earth and carbon dioxide from the Martian atmosphere. If an unmanned ship brings six tons of liquid hydrogen, using a chemical processing unit, 108 tons of methane and oxygen can be produced—96 tons for an Earth return trip and 12 tons to fuel Mars surface transportation. First, of course, the plant must be set up, working, and then signal the Earth that it is ready for an astronaut launch. If successful, it reduces, by a factor of 16, the amount of fuel and oxidizer to be sent to Mars for the return journey. With this plan, 2-4 SLS launch boosters could be required, rather than 16 SLS boosters. NASA must make a hard decision.

5. *Radiation* – Two kinds of radiation are of concern: radiation from cosmic sources and solar flares. I think all of the equipment and supplies will shield the cosmic radiation, as it did on the Apollo Moon missions. It is credible that an astronaut could receive 50 rems of radiation during the mission. This would change the lifetime risk of developing cancer for a 40-year old from 20 to 21%. No big deal!

Solar flares are high-speed protons (hydrogen nuclei) and can be lethal in a very large flare. They can probably be prevented by shielding and an early 40 minute-warning could be sent to astronauts. Some claim that a magnetic field can provide the needed shielding. I simply don't know.

6. *Cost* – Cost figures go from $400 billion down to $50 billion if we can make return fuel on Mars. (Double these costs!)

The biggest problem that I see is that a Mars mission would have to be an International program, such as the International Space Station was. The steadfast support of the American people, the Congress, and the Executive Branch is required. They are known to cancel programs like the Space Shuttle, the Super Collider, and the Constellation Program because of cost overruns, or for no reason at all.

7. *Impact by a Meteor* – Some predict there are serious dangers of a meteor as small as a golf ball wiping out the spacecraft. We have launched many deep-space spacecraft, such as the Pioneers 10 and 11, the Voyagers 1 and 2, Galileo, Ulysses, etc., that have been in space for up to 40 years without such an event.

8. *Life Support Supplies* – It was originally estimated that to support consumables for a crew of 6 for a Mars mission of 700 days would require 7,960 pounds of oxygen, 11,880 pounds of food (wet), 24,600 pounds of drinking water and 250,800 pounds of wash water (63% of total consumables). On the International Space Station, astronauts do not take showers but use a wet cloth to wash, a non-rinsing soap, and one cloth to dry. This approach should save considerable wash water on a Mars mission. In addition, recycling water, and the availability of water ice on Mars may help solve some of the water needs. I suspect the "wash water" consumable could be cut by 75% with in-depth engineering.

9. *Mars Habitat and Surface Transportation* – I don't think a habitat module is a problem. It will be placed on the surface, covered by sand bags. Will it be heated by a nuclear reactor or nuclear isotopes? Probably. Surface transportation should not be a problem, based on our lunar rover and Mars rover experiences. Incidentally, in August 2012, NASA landed a one-ton rover, the *Curiosity*, on Mars.

Final Thoughts

For 43 years, the USA has been the leader in space technology, having landed men on the Moon and returned them to Earth, having developed the only reusable manned spacecraft (Space Shuttle), and having assembled the largest Space Station ever built. Several of the world's leading space agencies are interested in sending men to the Moon. Our present interest is in sending astronauts to asteroids and Mars. Are we undertaking a program that America will support over the long run? Time will tell.

About the Author: Larry is very well known to Bulletin readers. He held leadership roles in Metals and Producibility on the Apollo and Space Shuttle programs. He served on the investigating teams for the Apollo I fire and the loss of Space Shuttle Columbia. *He has provided the Bulletin with several astute and scholarly articles including the last,* "Space Shuttle Challenge and Legacy: an Engineer's View".

Contrails From The Past

by Ed Rusinek

Dear Ed,

I am moving so I would appreciate your update of my address. Also, I enclose a few $ for the kitty. Have a new lease on life!

— Robert Nease, Austin, TX

Ed's Ans.: Thank you for a most generous gift. We hope that you find everything you seek in Texas. Vaya con Dios, Amigo!

Dear Bulletin Retirees,

I just wanted to say thank you for supporting an award I received as a top aero major at the Air Force Academy. It was extremely rewarding to see many years of hard work pay off in such a high honor and I am truly thankful for it. Thank you!

— 2nd Lt. Mark Boyer
USAFA, Class of 2012
Hershey, PA

Ed's Ans.: Not only a very sharp officer but also a very diplomatic one! Lt. Boyer, in your achievement, you honor us all. We are all very proud of you and we wish you the very best in all your future endeavors. God Bless!

Dear Ed,

WELL DONE! What an awesome Summer Bulletin. Your cover and the NAA awards presentation photos and write-ups were excellent. I loved the P-51 articles, they were informative and entertaining. Actually, the entire issue was very much worth reading. I still have to construct my P-51 model, just that I am getting lazy in my retirement.

— Stan Barauskas, Diamond Bar, CA

Ed's Ans.: You did a great job of representing all of us at the Academy. Your report about your visit to the U.S. Air Force Academy has generated wide interest and a number of volunteers for next year.

Congratulations and Best Wishes to

George and Louise Hewitt of Rogue River, Oregon
celebrating their 68th Wedding Anniversary

Norman and Norma Courvoisier of Long Beach, California
celebrating their 66th Wedding Anniversary

Amby and Shirley Baccaro of San Pedro, Calfornia
celebrating their 60th Wedding Anniversary

William and Beverly Zebrow of Corona, California
celebrating their 58th Wedding Anniversary



NASA/Bill Ingalls

The Space Shuttle* Enterprise *was towed on the Hudson River atop a barge on Wednesday, June 6, 2012, past the Statue of Liberty on its way to the Intrepid Sea, Air and Space Museum, where it is now on permanent display.

The Silent Majority

by Stan Guzy



ASTRONAUT NEIL ARMSTRONG, 82 – America's outstanding son passed away on August 25, 2012 following complications from heart bypass surgery. Neil Armstrong, the boyish reluctant American hero who always believed he was just doing what was expected, was a Navy fighter pilot during the Korean War, an X-15 test pilot and an astronaut with space time on the Gemini and Apollo programs. It is with heavy hearts that we include him in this Silent Majority



ASTRONAUT SALLY K. RIDE, Ph.D., 61 – passed away on July 23, 2012 after a 17-month valiant battle with pancreatic cancer. Dr. Ride was the first American woman in Space when she served as a Mission Specialist for Mission STS-7 aboard *Challenger*. She flew a second mission aboarsd *Challenger* for Mission STS-41G. She served as a member of the Presidential Commission investigating both Shuttle accidents. In 1989, Dr. Ride joined the faculty of the University of California San Diego as a Professor of Physics and Director of the University of California's California Space Institute. In 2001, she founded her own company, Sally Ride Science, to motivate young women to pursue careers in science, math and technology. Sally Ride was an American Treasure.

ARTINGSTALL, THOMAS, 89 – passed away on July 23, 2012. After earning a B.S. in Mechanical Engineering from the Illinois Institute of Technology, he joined Autonetics as Chief Designer for the Radar/Transmitter Development Staff, moved to LAD in Avionics and research areas and, later, to Space Division in the development of the Space Shuttle Payload Arm. He was listed in Who's Who of the West and received numerous awards for his achievements. Tom is survived by his wife of 47 years, Arloah.

BALL, JAMES H. "JIM", 89 – passed away peacefully in Ventura, CA on May 24, 2012. Jim joined NAA in 1941 and dedicated his entire career there except for the time he served in the U.S. Army Air Force during WW II. He worked in Engineering and Proposal Management for 38 years when he retired in 1979.

BATSON, ROY "PUNKY", 69 – of Corona, CA passed away on June 5, 2012. Roy retired from Rockwell/Boeing with 31 years of service. He is survived by his wife Linda.

BELLASPERANZA, DOMINIC J., 85 – passed away on June 13, 2012 in Fairhope, AL. He came to Antelope Valley, CA as a Facilities Engineer. Working on many programs including the Space Shuttle, he managed to earn an Engineering Ph.D. before he retired with 36 years of service.

BISCHOFF, JACK E., 80 – died on May 11, 2012, after a long illness, in Norco, CA. He worked at Autonetics and during his career was involved in the bidding, capture and performance of many major ICBM contracts.

BISSELL, WILLIAM R. "BILL", 77 – died in Thousand Oaks, CA on May 11, 2012. After earning an M.S. degree from Rensselaer Polytechnic Institute, Bill joined Rocketdyne and was assigned to Advanced Programs where he worked on advanced technology for the Apollo and Space Shuttle programs. He was awarded three patents involving pumps for turbo machinery. He retired in 1992 and trekked all around the world with his wife Margaret.

BRIGHT, CHARLES W. "BILL", 86 – passed away suddenly at home in Lancaster, CA on July 4, 2012. During military service, he worked on missiles and rocket propulsion systems, leading to a career at Rocketdyne. Subsequently, he moved to Space Division to manage the final checkout operations of the Apollo Command Module. With the end of the Apollo Program, he moved to LAD to develop and build the B-1. He retired in 1992 from Palmdale with 38 years of service. He is survived by his loving wife, Donna.

CAMERON, MARY R., 89 – of Los Gatos, CA died on March 17, 2012. At 18, she came to California for a vacation in December 1941 and joined LAD as a Production Control record keeper with her pay being 60¢ per hour. Over the next ten years she advanced at LAD Manufacturing, moved to Downey where she served in Manufacturing Cost Analysis and, finally, moved to Anaheim with the Autonetics Group. There she advanced in department management for Production Operations. She retired in 1980 and served as a consultant at the Dallas, Atlanta, and Anaheim facilities for another 3 ½ years. Her view of working for NAA/Rockwell was, *"There are a lot of things you can do at this company. There's a sense of freedom. I've been given very interesting jobs. Management has often said to me,* 'There's a problem over there, see if you can solve it.' *That's been the challenge. When you get involved in that sort of thing, work is not drudgery."* Mary retired as the highest ranking woman in the history of North American Aviation and Rockwell.

COMMERFORD, GERARD L. 78 – passed away on July 3, 2012 surrounded by his family after a courageous battle with cancer. Earning a B.S. and an M.S. in Aeronautical Engineering and Aerospace Technical Management, he worked on the Shuttle Program and was instrumental in achieving a successful Return to Flight of the Space Shuttle. He received many awards and was admired for his integrity and character. He retired in 1996 with 38 years of service. Gerry is survived by his beloved wife, Nancy

CUTHBERT, THOMAS W., 74 – passed away on July 15, 2012 at the Wisconsin Veteran's Home – Stordock Hall in King, WI. After serving in the Navy, Tom came to NAA/RI in 1966 and retired in 1999. He is survived by an extended family.

DUPAQUIER, PIERRE M. "PETE", 82 – of Long Beach, CA lost his battle with cancer on August 7, 2012. Serving 34 years, he retired from Space Division in 1986 as supervisor of Structural Analysis on the Apollo and Space Shuttle programs. A very unusual and talented individual, Pete was a civilian pilot, a sailing enthusiast, having sailed to many Pacific Islands with a sextant his only navigational tool, a long distance cyclist, a ham radio operator in the days of Morse Code, and a jogger and a marathoner. He is survived by his wife Anna.

FESLER, LLOYD W., 85 – went to his reward on August 4, 2012 from undisclosed causes. After working his way through college in Missouri, he came to California and went to work at NAA/RI in 1951 and began a computer programmer career that lasted 40 years until his retirement from NAA/RI in 1990. His wife, Peggy, preceded him in death.

HASTINGS, GENE F., 77 – passed away peacefully in Anaheim, CA on April 15, 2012 with his family at his side. Graduating from San Diego State University with a B.S. in Mechanical Engineering, he began his career with NAA/RI in 1959. He retired in 1995 with 36 years of service. Gene was married to the love of his life, Joan, for 51 years.

HESGARD, NORMAN A., 90 – of Placentia, CA died on August 18, 2012. After graduating from Oregon State in 1955, he moved his family to Southern California where he spent his 30-year career as an electrical engineer with NAA/RI. Norman is survived by his wife of 70 years, Wanda.

HOOPS, HOWARD M., 92 – died in Hamilton, TX of pneumonia on May 22, 2012. Howard was a flight instructor and fighter pilot during WWII. He worked at Edwards AFB before coming to Autonetics and serving in Data Management. He retired in 1981 with 20 years of service.

HORVATH, JOSEPH "JOE", 90 – died at his home in Pennsylvania on June 12, 2012. He was a USMC veteran of WWII, received the Purple Heart, worked at the Long Beach Naval shipyard and NAA/RI before retiring. He is survived by his wife of 67 years, Margie.

HURZELER, JAMES E., 94 – of Palos Verdes Estates, CA passed away on July 5, 2012. Jim was passionate about his work and about North American Aviation. He retired from LAD in 1979 with 33 years of service, having worked on all major programs including the F-100, B-70, HIMAT, B-1, and X-15. He is survived by his loving wife of 70 years, Coleen.

KEANE, EDMOND J., 89 – passed away peacefully on July 19, 2012. Ed served in the Navy and attended Loyola University where he earned a B.A. in Business. He then joined NAA/RI where he enjoyed a 30-year career in the field of Human Resource Management. Ed's wife, Rosemary preceded him in death.

KENNEDY, DAVID, 84 – died on August 13, 2012. Raised in Pennsylvania, Dave and his family eventually settled in Orange County, where they lived for forty-five years. Dave held two Masters Degrees, the first in Engineering and the other in Business Management. He was a Quality Control expert at the Marine Systems Division and worked on every autonavigator used by Navy submarines. He retired in 1989 with 35 years of service. Dave was preceded in death by his "Princess" Janice, after 52 years of marriage.

KOCH, ALAN, 73 – passed away in Phoenix, AZ on June 8, 2012. Alan suffered a massive stroke on May 25, 2012 while hiking in Switzerland. He retired from NAA in 1994 after 34 years of service and enjoyed 18 beautiful years in Prescott, AZ. He is survived by his loving wife Terry.

KOVICH, ROBERT, 72 – passed on peacefully on May 12, 2012. Bob earned a B.S. and M.A. in Mathematics while attending North Dakota State University. He joined Autonetics in 1963 and retired in 1997. He is survived by his wife of 49 years, Wilda.

KRAVITZ, JERRY R. – of Mission Viejo, CA. The Bulletin received notice that Jerry passed away on March 25, 2012. He retired from LAD in 1993 with 39 years of service. He is survived by his loving wife Mary Ann.

LUSSIER, PHILAS J., 84 – passed away on February 23, 2012 in Orange, CA. Phil was born in Tupper Lake, NY, served in the U.S. Navy and eventually settled in Southern California. He joined NAA/RI and served diligently for 35 years before retiring in 1992. Phil was very active in community affairs and is survived by his wife of 63 years, Carolyn.

NEWBILL, WILLIAM A., 85 - died on June 24, 2012 in Lancaster, CA. He was born in Memphis, TN, came to Southern California after military service and lived in Antelope Valley for the past 14 years. Bill retired from NAA/RI with 32 years of service. He is survived by his devoted wife, Juanita.

NIELSEN, DONNA, 87 – passed away peacefully at her home in Torrance, CA on January 9, 2012. She was an active member of the U.A.W. and retired from NAA in 1985 with 33 years of service. As a planner on the Space Shuttle program, she proudly met several of the astronauts.

NUTT, JOHANNA, 100 – of Huntington Beach, CA, passed away peacefully on June 11, 2012 in Long Beach, CA. She retired from NAA in 1974 and found delight in babysitting and enjoying her family.

OQUIST, HAROLD O. "HAL", 77 – died in Montecito, CA on July 3, 2012. He retired from Rocketdyne with 30 years of service on many programs including the RS-14 Minuteman Postboost Velocity Control Engine, Apollo Lunar Excursion Module, Saturn Engines, Atlas Missile and Launch Vehicle Engines and Space Shuttle Main Engines. He was preceded in death by his wife Valerie, also an early Rocketdyne employee.

PURCELL, FRANK L., 95 – passed away on May 21, 2012 in Lancaster, CA. Frank and his bride came to California in 1937. Frank worked for Douglas Aircraft and North American Aviation on several experimental aircraft projects. After retirement, he became a Real Estate broker in the Lancaster area. His wife of 74 years, Sybil, preceded him in death.

RUGGLES, JOSEPH J., 88 – passed away in Worthington, OH on June 30, 2012. Graduating from Ohio State University in 1950 with a B.S. in Industrial Engineering, Joseph joined NAA at the Columbus Division. He retired in 1984 after a long career in Facilities & Industrial Engineering management.

SCHROEDER, KATHLEEN, 68 – a longtime resident of Yorba Linda, CA, passed away peacefully on August 14, 2012 after a heroic five and a half year battle with breast cancer. Her spirit and strength through this ordeal will forever serve as a life lesson for all who knew and loved her. Kathy settled in Southern California where she began her career as a Director of Communications for NAA/RI and the Boeing Corporation. Kathy was preceded in death by her loving husband Robert.

SHEA, JAMES P. "PAT", 83 – of Fallbrook, CA passed away on March 15, 2012. After graduating from high school, Pat continued his education in the Naval and Air Force Station at Portsmouth, VA as an aircraft instrument mechanic, field service instructor, A&E mechanic and jet fighter specialist, earning his private pilot's license. He joined LAD in 1954 as a Tech Rep on the F-100, moved to Missile Division on the Navaho and Hound Dog, and, finally, to Management at Autonetics for radar on the F-104, F-105, F-111, antennas for GPS satellites, and numerous guidance packages for tactical missiles. He retired in 1992. Pat is survived by his loving wife of 60 years, Sylvia.

WOODWARD, EDWIN F., 79 – died peacefully in his home in Holland, MI on August, 18, 2012. He received his B.A. in Political Science from UCLA in 1955. He began his career as an educator, but, in seeking a better quality of life for his family, Ed joined NAA/RI, as a Cost Analyst on the Apollo and Space Shuttle programs. His family's fondest memories of him include enjoying his intellect, quick wit and sense of humor.

WRIGHT, PAUL C., JR., "PC", 91 – died on February 26, 2010 in Columbus, OH. Paul joined the Columbus Division in 1956 as an electronics and antenna engineer and retired from the B-1 Division at Palmdale in 1979 where he served on numerous programs including the A3J, B-70, B-1, and Apollo. After retirement, he served at Wright-Patterson AFB on B-52 electronic countermeasure techniques and hardware design.

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North American Aviation Retirees Bulletin
"Where The Best Never Rest"

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Photo courtesy of Historian Christian Gelzer, Ph.D.

Space pioneer Dr. Wernher von Braun visits the Flight Research Center at Edwards Air Force Base in the early 1960s to examine the X-15, the world's first space plane. Being a pilot of long standing, he could well appreciate the intricacies and significance of an airplane that would fly into space and return to Earth under control of the pilot.

NORTH AMERICAN AVIATION
Retirees Bulletin
"Where The Best Never Rest"

Winter 2012

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Painting by Nicolas Trudgian, courtesy of the Artist

***On the morning of New Year's Day 1945, the Luftwaffe launched a surprise attack, code named* "Operation Bodenplatte",** ***on many Allied airfields in France, Belgium and Holland with remarkable success. However, anticipating just such a possibility, Lt. Col. John C. Meyer, the commanding officer of the 352nd FG, placed the 487th FS on alert at Asch, Belgium. As the Germans swept across the field, Col. Meyer and eleven of his pilots arose with guns blazing as their landing gears were still retracting. Twenty-three German pilots of JG 11 were shot down without a single American loss. British aviation artist Nicolas Trudgian captures this moment of intense action in his marvelous painting,* 'The Battle for New Year's Day'.**

NORTH AMERICAN AVIATION
Retirees Bulletin

North American Aviation Retirees Bulletin, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

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Dear NAA Retirees Bulletin Subscriber

And so we come to the end of another year! With our next issue, we begin our fourteenth year as castaways from Boeing and totally reliant on your support. All of you Silver Eagles that joined us in the earlier years are now getting your copies for FREE! However, sadly, as the years slip away, many of you have left us and are not here to enjoy this happy occasion.

So many of you have told us how much you enjoyed the death defying P-51 Mustang story by "Punchy" Powell. So we asked him to provide us with another exciting chapter in the history of the Bluenosed Bastards of Bodney. This one begins with the only night mission flown by his Fighter Group. It starts out tragically but goes on to a very successful conclusion over the beaches of France on D-Day and the days that follow.

When we need a story of ingenuity, initiative and just plain "nerve" we call on Cleve Kimmel, up in Billings, Montana. North American Aviation was proposing on a prototype design of a machine that would be used by Apollo Astronauts to train for the actual landings on the Moon. There was no budget to go with the assignment, so his team performed with inspiration, élan and a bit of chicanery to design and assemble an entry for the proposal.

For the past four Winter Issues, we were fortunate to have a famous Aviation Artist provide us one of his paintings depicting a P-51 Mustang in combat action. This year we asked famous British Aviation Artist Nicolas Trudgian to favor us with one of his P-51 Mustang paintings. He generously provided us a choice from his splendid collection and we selected two of them for our front and back covers. His work doesn't just depict an airplane in an empty sky or standing on the ground. His preparation includes research of a historical moment that he captures in his painting. This provided us a splendid opportunity to invite him to write an article for us about how he goes about to create a painting. Hence, here we present the artist with **"Capturing History On Canvas"**.

Now that we have whetted your curiosity about what you will find in this issue of the Bulletin, we are going to ask you for a donation. The National Museum of the United States Air Force at Wright-Patterson AFB in Dayton, Ohio has notified us that our request to endow a black marble memorial bench on the museum grounds honoring North American Aviation, Inc. has been approved. The cost is substantial but achievable if you, our readers, join us in this endeavor. The bench will bear the NAA logo and the names of all NAA divisions because all participated in our inspirations and in our successes!

If this issue bears the designation **December 2012** above your name and address, this is your last issue unless you renew. Many of you honored our request for an early renewal and have renewed. But there are still many others that have not. Sadly, some have departed this world but others are still very much alive but very busy and renewal is of low priority to them until they don't receive the Spring 2013 Issue. Please take a minute and do it soon. Also, with the holidays approaching, give a thought to a friend or relative that may be bedridden or in an assisted living facility who would enjoy receiving four issues of our Bulletin next year. To notify him of your kind thought, we will send him a copy of this issue with the note announcing your generous thoughtfulness.

In this Holiday Season, please remember Sonnie Robertson in your prayers! She is battling a very debilitating, unrelenting and painful eye condition and she needs all the prayers we can muster. Prayers are never wasted and yours may just be the blessing she needs.

To our Christian friends: All the Blessings of Christmas on You and Yours!

To our Jewish friends: All the Happiness of Hanukkah for You and Yours!

To all our friends: May the New Year Bring You Health and Good Cheer!

Remember, Stay healthy! Keep moving! And make it hard for the Devil to find you!

Bluenosed Bastards Over Normandy On D-Day

by Robert H. "Punchy" Powell, Jr., Captain, USAF (Ret.)

As the 352nd Fighter Group pilots shut down their engines after completing their missions on June 5, 1944, a series of unusual events occurred at their base at Bodney. All the British civilian workers on the base were rounded up, taken to headquarters and advised they would not to be allowed to leave the base. Double guards were posted on all the roads leading to the base and along the perimeter road. Our support personnel were issued live ammunition and put on alert. At 1600 hours (4:00 p.m.), all crew chiefs were summoned to meetings and given an unexpected assignment.

Cans containing black and white paint were issued and instructions were given on how to paint black and white identification stripes on every Mustang that was combat ready and this task was to be completed by 2200 hours (10:00 p.m.). This meant that about 100 aircraft were to be striped in just six hours. These crews painted with any size brushes they could find, even used mops and rags or whatever they could improvise and got it done. The Army Air Force had an old saying, *"The difficult we do immediately. The impossible takes a little longer."*

Meanwhile, the pilots and other personnel were not aware of what was happening until the 352nd Fighter Group Commanding Officer, Col. Joe Mason, came into the bar in the early evening and told us we had better get some rest because we were going to need it. Some of us went to our cots, but didn't sleep much because an orderly came around to tell us that all pilots were to report for "breakfast" at 2200 hours and to a mission briefing at midnight.

Tensions were high in the briefing room. Since the Field Order had come down from Fighter Command, the Operations staff had been working feverishly plotting flight courses, scheduling take-off times and preparing the necessary data for the briefing at midnight. As the pilots gathered, the chatter was noisy until Col. Mason walked in and "Attention" was called.

Colonel Mason announced that the next day, June 6th, was truly to be D-Day and explained that the 352nd's role would be providing part of a wall of fighter aircraft, including the British, to shield the invasion forces from any Luftwaffe attacks and that the invasion was already underway. The Operations Officer then took over and announced the first takeoff would be at 0230 hours (2:30 a.m.) with the 486th Fighter Squadron the first to takeoff and the other two squadrons taking off at varied time intervals to coincide with the other squadrons also taking off at defined time intervals to provide overlapping coverage of the invasion area. Then "Stormy" Gyspers, our chief weather officer, gave us the news of the 'not too good' weather we would be flying through. Later, at our 328th Fighter Squadron Briefing, Dr. Kenneth Lemon told us that, *"He had orders to keep us flying until the beaches are secure, even if he had to give us pep pills to keep us going."*

After the initial briefing, most of the pilots went to their planes to make sure they were as we wanted them with instrument panel lights adjusted to the night level, the altimeter set and all switches in the proper position. Then, the pilots of the 486th had nothing to do but wait for the appointed hour.

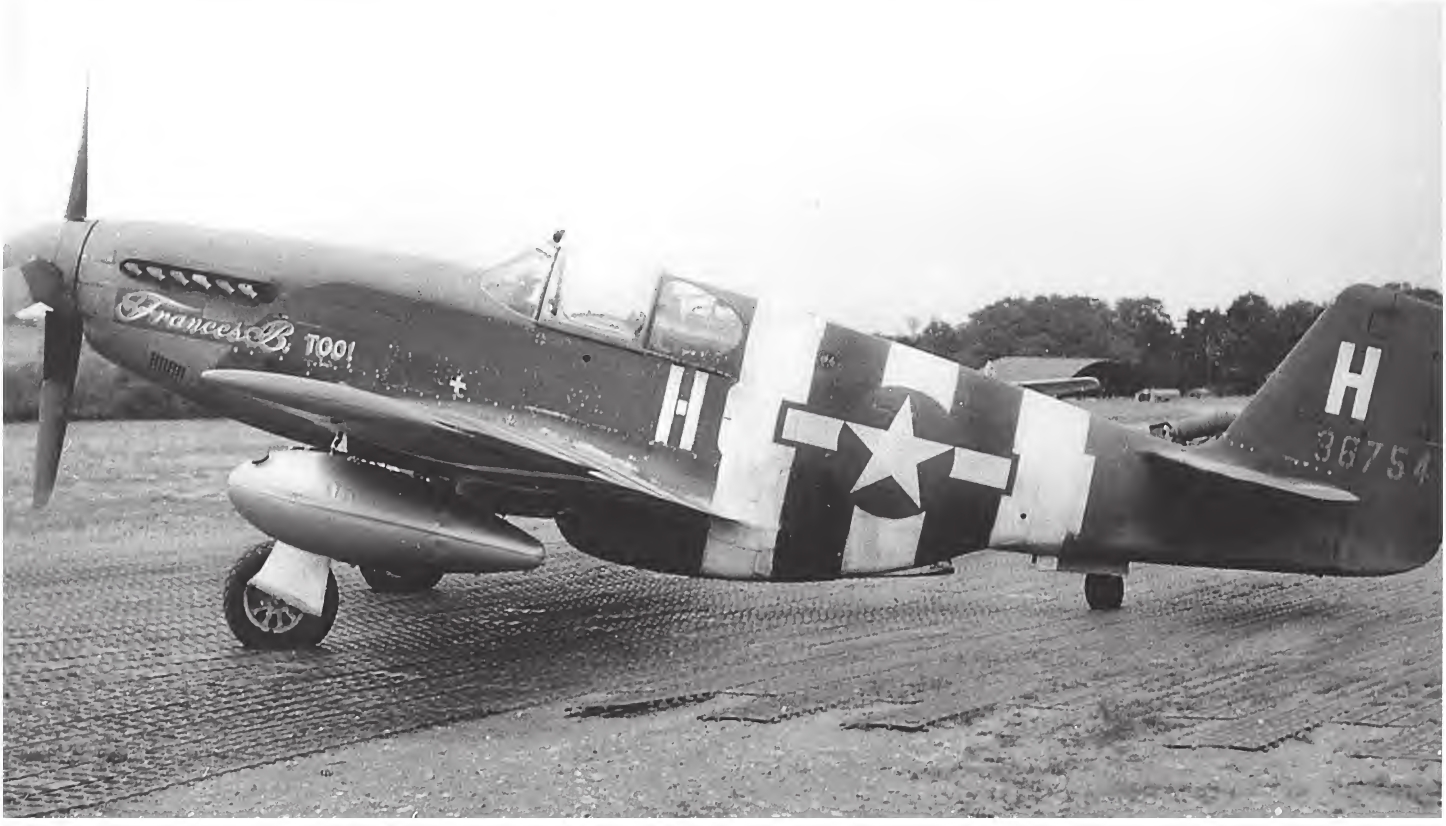


Photo courtesy of Sam Sox, Jr.

***"Who messed up my Mustang?" Pilots found their airplanes hastily painted with D-Day "Invasion Stripes" meant to identify Allied aircraft such as Lt. Ham Hamilton's* "Francis B. Too!".**

As they went to their planes, the moon was trying to shine but by takeoff time was obscured by the clouds and it was very dark with a few drops of rain adding to the gloom. This would become a time to remember forever, but none of us anticipated the dramatic beginning of that historic day. For the "Bluenosers" it would include tragedy, intense excitement and mystery before they would again emerge in glory.

Despite the precautions taken to assist the pilots in our first and only night takeoff from our grass field, things went wrong from the start. With no runways to guide us, a string of tiny lights had been laid across the field to provide a take-off direction. At the prescribed time, the 486th pilots started their engines and taxied out to get into takeoff position, four abreast only a few feet apart with each flight lined up behind the lead flight, sixteen aircraft. Unfortunately, the first flight taxiing out snagged the string of lights marking the takeoff direction and the remaining flights lined up in total darkness, setting the stage for tragedy.

With no lights for guidance, it appears that Flight Leader Martin Corcoran lined up slightly to the right of the proper direction and he and the three other pilots in his flight, only a few feet apart, pushed their throttles to full power simultaneously. Flying Corcoran's wing for takeoff was a Mustang called *"Umbriago"* flown by Lt. Robert Frascotti on what was to be his 89th and final mission.

As the four P-51s lifted off the ground, a sudden flash of light pierced the darkness and a tremendous explosion rocked the field. Bob Frascotti had flown into the dark unfinished Control Tower that was being built on the highest point on our field to become the Group's first D-Day casualty. Lt. Bud Fuhrman, flying on Frascotti's right, without even seeing it, barely cleared the tower. He had just become airborne and he flew through the flames shooting out from the explosion, momentarily blinding him from seeing his instruments. Lt. Charles Griffith, another member of that flight, struck one of the volleyball posts in front of the 328th Squadron Pilot Ready Room, felt his plane shuttering and went to full power to get into the air. The rest of the squadron took off in the light of the burning aircraft.

In the 328th Ready Room, the pilots were being re-briefed for their mission scheduled for a later time and near panic hit



Photo courtesy of Sam Sox, Jr.

***Lt. Martin E. Corcoran relaxes on the wing of his P-51 Mustang* "Button Nose".**



Photo courtesy of Sam Sox, Jr.

***Lt. Robert C. Frascotti with his P-51,* "Umbriago".**

the pilots with the explosion, blinding light and fire less than 50 yards from their doorway. Ammunition from the crashed aircraft had detonated and bullets began flying in all directions, some pilots began running through the one door while the smarter ones dropped to the floor. Some of us dove out the open windows. On my way out the window, I stepped on someone on the floor. Late that D-Day, when we got back from our mission, Major Hal Lund, our Executive Officer, asked, *"Who was that S.O.B. who stepped on me going out the window this morning?"* As a lowly 1st Lieutenant, I was not about to admit my guilt!

Years later, at a football game between the Air Force Academy and the Naval Academy, I was sitting next to the former Major Hal Lund of the 328th. I said, *"Hal, do you remember asking who that S.O.B. was who stepped on you on his way out the window on D-Day morning?"* When he nodded, I said, *"Well, I was that S.O.B."* We both had a good laugh.

Our first Group mission was virtually uneventful except for the tragic start. The sky was heavily overcast and we could only get quick glimpses of the troops storming the beaches as we flew over them to our positions over Normandy. Official records show that no enemy aircraft penetrated that wall of aircraft to get to the troops on the beaches, a testimony to the 8th Fighter Command, that we had achieved air superiority, thus making the invasion possible.

Our 328th Squadron, was dispatched on our first mission at 0521 hours (5:21 a.m.) and we were the first to spot and attack enemy troop movements behind the mission front. In our briefing, we were ordered to consider anything moving toward the beaches as "fair game" and directed to stop it. The French partisans had been warned to stay off the roads and in their homes, so any movement toward the beaches would be considered the enemy.

We flew our second and third missions assigned a small section of Normandy with a grid map of a specific section for us to patrol in two plane elements looking for targets of opportunity. We shot up truck convoys, trains, troops and even dispatch riders on their motorcycles. There was no enemy opposition except for heavy and accurate ground fire in some instances.



Photo courtesy of Sam Sox, Jr.

P-51Bs of the 486th Fighter Squadron are serviced at Bodney on D-Day + 2 for another combat mission over the beaches of Normandy.

At Bodney, our ground crews and service personnel were refueling and rearming the returning Mustangs while we grabbed a sandwich and answered Nature's call before heading back to Normandy on another mission. These missions lasted between five and six hours each with many of our pilots in the air about 16 hours on D-Day. It was, indeed, the "Longest Day".

The Luftwaffe did not show up until about twelve hours and six squadron missions after D-Day began. Red Flight of the 328th Squadron had just arrived in the Rouen area and started diving on their target when a flight of eight Fw 190s was encountered. On seeing them, Flight Leader Francis Horne ordered his flight to jettison their bombs and engage the enemy. He and Lt. Allain climbed to attack the Fw 190s, which split. They were following and attacking one Fw 190 when they were attacked by another. The second Fw 190 and Horne blazed away at each other in a head-on pass before breaking off. Lt. Allain took a 20mm hit in his left aileron before hitting the enemy aircraft and sending him away trailing smoke. In the meantime, Horne saw his attacker bail out of his damaged aircraft while Lt. Richard Bfookins downed another after a brief dogfight.

Back at Bodney, as the 487th ground crews were preparing their planes for their third mission, they started dropping like flies. All sorts of rumors were flying around about food poisoning since this started happening shortly after the lunch break. Finally, Flight Surgeon George Dodson determined that they had eaten some tainted rice pudding from the mess hall. Most of the stricken men were back to duty the next day, but the food poisoning did hamper getting the 487th off on its third mission.

All three squadrons returned from these missions with claims of destroying or damaging German controlled railways and highways, vehicles, rail facilities and other targets, but this time it was not without cost. The 487th lost two planes and one pilot on the third mission, Lt. Robert O'Nan and Lt. Robert Butler having been downed by flak. O'Nan was captured when he parachuted into German controlled territory, but Butler came down behind our lines and was returned to Bodney soon after the incident. In the next few weeks after D-Day, as

the "Bluenosers" continued providing ground support to our troops, there were a number of losses to enemy ground fire. But, as our troops occupied territory in Normandy, the Ninth Air Force moved onto the Continent and took over the tactical mission supporting our ground forces while the Eighth Air Force fighters returned to our primary mission of supporting our B-17s and B-24s in the destruction of Germany's ability to continue the war. It was almost a year later that our troops swept across France and into Germany to bring the war to an unconditional surrender by Germany. Without air power, this could never have happened and there is little doubt that getting the North American P-51 Mustang into action was the turning point in the Air War in Europe.

About the Author: Wow! After a closing sentence like that, what can we say about our fantastic author! A native of West Virginia, Robert "Punchy" Powell joined the USAAF immediately after the attack on Pearl Harbor. Assigned to the 328th Fighter Squadron of the 352nd Fighter Group stationed at Bodney, England, he is credited with six destroyed in the air and on the ground and two probables in the air and on the ground. Recalled to active duty in 1950, Bob served four more years as a test pilot and public relations officer. The sobriquet "Punchy" was bestowed on him in high school the year he won the West Virginia Golden Glove championship in the flyweight division. He currently resides in Atlanta, Georgia with his charming wife Betty.



Photo courtesy of Sam Sox, Jr.

Capt. Walter "Willie" Starck, 487th Fighter Squadron, and his ground crew checking out his P-51 Mustang named* "Starck Mad" *between missions.

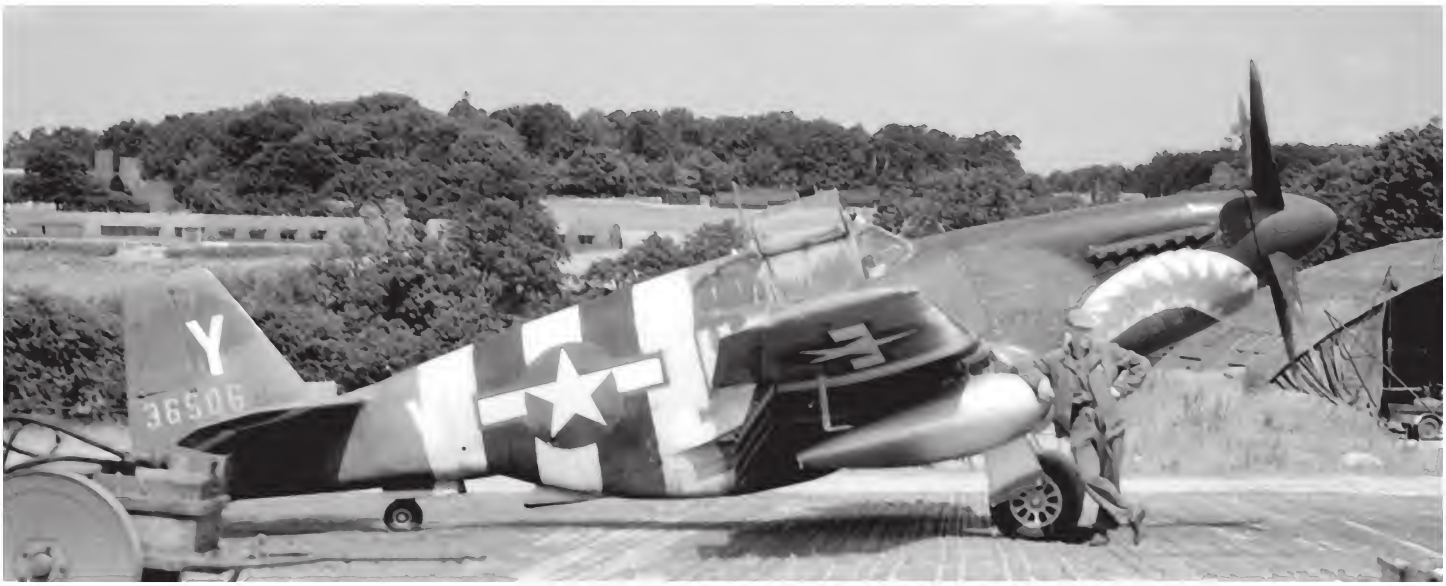


Photo courtesy of Sam Sox, Jr.

Lt. John R. Bennettes of the 487th Fighter Squadron stands with his "Shark Mouth" P-51B prior to a bomber escort mission.

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The NAA Lunar Landing Research Vehicle Program

by Cleve Kimmel

NAA had garnered the much-coveted Apollo Space Craft contract, and, subsequently, attempted to win the Lunar Landing Research Vehicle (LLRV) contract too. This design was equally as complex as the Apollo, and carried with it the absolute need for astronaut safety. This meant that the astronauts had to not only land on the moon at a specific location, but would have to traverse back to the Command Module for their journey back to earth. The complex engineering design requirement to establish a stable flight platform was the main objective of the research for this endeavor.

The Project Manager, Bob Barker, wanting to get the Lunar Lander Test Program for NAA, came up with a brilliant marketing ploy. There were insufficient funds in the budget to both build the Lander vehicle and to purchase the engine needed to conduct the test. This test system resembled a pancake, and was to have a jet engine mounted in the center with its thrust vector pointed down. The astronaut/test pilot would use it as a test vehicle in Idaho to gain a better understanding of the real Lander's flight characteristics once he was on the moon.

NAA had, some years back, dug up an old General Electric engine from an F-100 that had crash landed in a remote area in India. Bob Barker took out a full-page ad in the local newspaper where the GE plant was located, plus a two-page ad in the Wall Street Journal. It provided a close-up view of the battered GE engine, with its serial number clearly visible and proclaimed that future flights would be made safer by testing with this refurbished GE engine being used by NAA! Upon seeing this ad, the GE General Manager inquired where did NAA get the engine? They discovered that this was a crash site engine that was completely inoperable. The GE GM called NAA, swore at Bob Barker, and said, *"Alright, you win this one. I'll give you a new engine, but only because this stunt of yours was the best trick ever pulled on me!"* Of course, since the program didn't have enough money for the engines, it also lacked funds for the guidance control systems!

Stored at Edwards AFB were three obsolete F-86 NAA fighter planes destined to be towed to a gunnery range and used for target practice. The project manager had me remove the guidance packages from two of them for use on the platform. It wasn't until two years later that I learned he didn't have authorization for their removal!

Having all parts in hand, NAA constructed a flight test bed, which was to simulate the problems encountered during a lunar landing and to train the astronauts accordingly. Basically, it could simulate various rapid descent and glide/landing patterns expected during the lunar landing. I believe the unit's mass was comparable to the 1/6th expected gravity on the moon. The testing platform, pictured with Joe Walker, performed very well. The GE engine is in the center of the craft.

However, not all good efforts get rewarded. The LLRV production contract went to the Bell Corporation. The production contract for the final Lunar Excursion Module (LEM) was awarded to the Grumman Corporation.

Extracted from: NASA Technical Note D-3023, 1965, Edwards AFB; these were the design considerations:

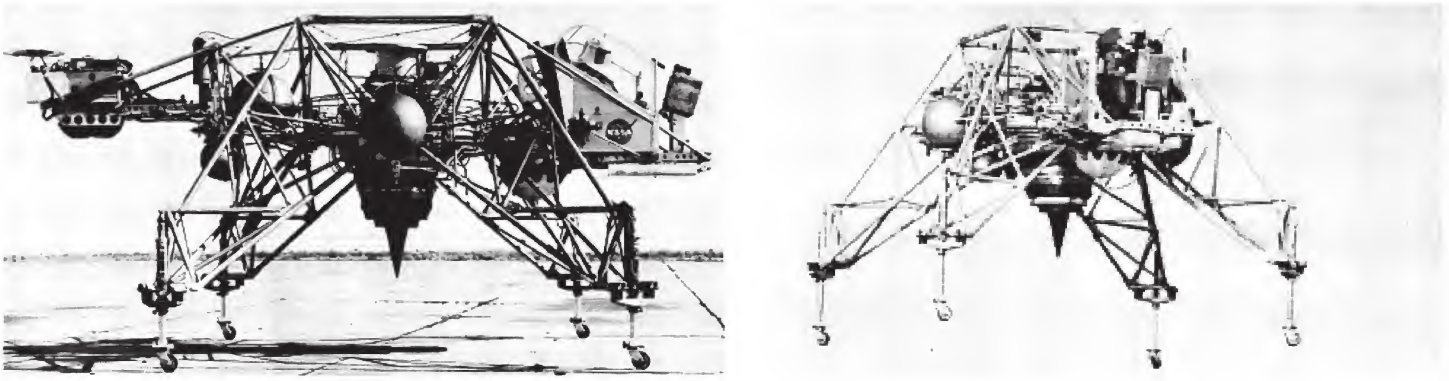
The successful achievement of this country's goal of landing a man on the surface of the moon and returning him safely to earth will require much research in many different fields. One of these areas is control of the vehicle by the human crew. It is expected that a major portion of the terminal descent and landing maneuver and the docking maneuver on return to orbit will be controlled by the crew. Such control will logically add to the mission reliability; the crew will be able to assess the suitability of the surface for landing and apply their control capabilities to provide a flexibility that would be impossible to achieve with an automatic system.

Considerable study is needed to determine the capabilities of such a crew, the displays required, and the control authority necessary to make the most effective use of the human occupants. As a means of conducting such research, the NASA Flight Research Center, Edwards, California, obtained a specially developed free-flight vehicle, designated the Lunar Landing Research Vehicle. Figures la and lb (page 9) are photographs of the vehicle on the ground and in flight, respectively. On the earth, jet-supported vehicles, such as helicopters, can be maneuvered horizontally by tilting the lift-thrust vector a few degrees, thus creating a horizontal force component without significantly changing the vertical component.



NASA Photo

Joe Walker was the first man to pilot the Lunar Landing Research Vehicle (LLRV) and helped verify and develop the flight techniques the astronauts would use to perform lunar landings. He was the Chief Research Pilot at the Dryden Flight Research Center at Edwards AFB. He also piloted the D-558-1, D-558-2, X-1, X-3, X-4, X-5 and completed 24 flights with the NAA X-15. Walker was killed on June 8, 1966 when the F-104 he was piloting collided with the XB-70 #2.



NASA Photo

Figure 1. Lunar Landing Research Vehicle (a) On the ground; (b) In flight

On the moon, however, because of the reduced gravity, the lift-thrust vector is only one-sixth as great as on the earth; hence, to achieve the same horizontal acceleration the vehicle would have to be tilted about six times as much. Thus, what would be a rather simple maneuver on earth could be difficult and hazardous on the moon.

This lunar effect is achieved on the LLRV by supporting the vehicle with two separate propulsion devices. Five-sixths of the vehicle weight is supported by a jet engine mounted vertically in a gimbal at the center of gravity of the vehicle. A system of gyros and hydraulic servos keeps the jet engine essentially vertical with respect to the earth, regardless of the vehicle's attitude. One-sixth of the vehicle weight is supported by a pair of rockets mounted on the main frame of the vehicle, one on either side of the jet engine. All horizontal maneuvering and braking is accomplished through the use of these rockets combined with the tilting of the vehicle under the pilot's control. A pilot flying the vehicle has essentially the same angular motions and visual cues that he would have if he were in a lunar gravitational field. Insofar as practical, automatic devices on the vehicle compensate for aerodynamic forces and moments, thus, simulating the lack of significant atmospheric effects on the moon.

Figure 2 shows how the LLRV will be used to simulate the final portion of a lunar-landing trajectory. The vehicle has the capability of duplicating the descent of the lunar surface from an altitude of about 1,500 feet, including such maneuvers as hovering and horizontal translation. A lunar takeoff can also be simulated.

Two lunar-landing vehicles from Bell were delivered to the Flight Research Center in the spring of 1964, and there they were devoted to checking systems and installing research instrumentation. During this period, many minor changes were made in the systems and the configuration.

The first flight was on October 30, 1964.

About the Author: Subscribers will remember Cleve for his erudite reports on his work in designing the X-15 fuel system. A gifted engineer, he has the ability to read and comprehend technical reports at 9,000 words per minute. Taking early retirement, he currently resides with his lovely wife, Adonna, in Billings, MT.

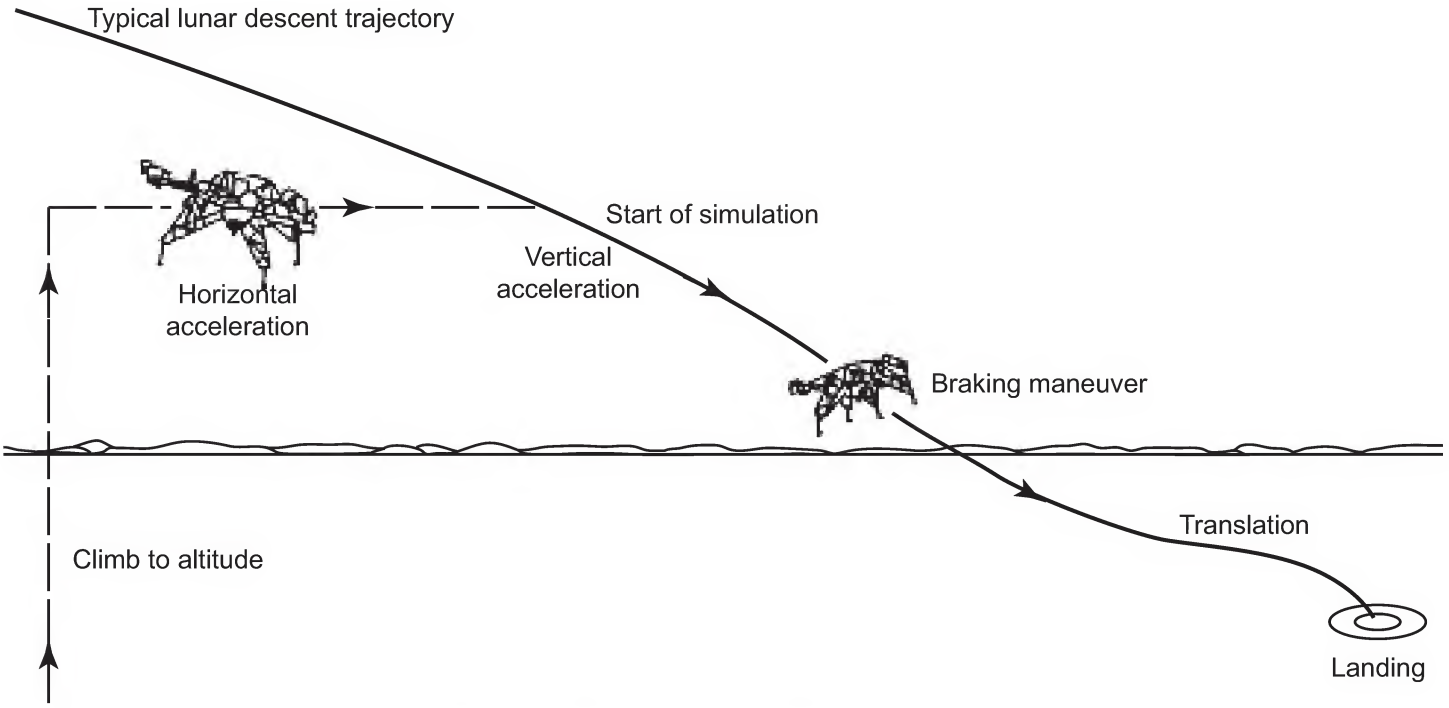


Figure 2. Lunar Landing Research Vehicle Trajectory

Capturing History on Canvas

by Nicolas Trudgian

It's hard to believe that 2012 marks my 30th year as an artist. As a youngster, I was warned by friends and family that artists usually end up starving in garrets and I should get a proper job instead. When I've had a bad day, when every brush mark seemed disappointing, I wondered if they were right. But, then I would reflect that I have had it so easy.

Painting military aircraft is so much easier than actually flying combat missions and without the men who did just that I wouldn't have a job at all. I have been so fortunate to make a career depicting the remarkable things that other men did. Never is this more clear than when I meet the men who flew those aeroplanes, an aspect of my past three decades that has meant most to me.

Living in Europe, I've had the splendid opportunity to meet quite a few of the Luftwaffe airmen and, of course, even more of the RAF pilots and crewmen. There have been precious occasions when, in the course of signing prints, these former adversaries have been brought together. As a youngster, fed on a diet of war films where the Germans were the 'bad guys', it is heart-warming to discover what fine people these airmen really are. They were, for the most part, just doing their duty as best they could and in that respect they have so much in common with our Allied veterans. In fact, because of the similar experiences they encountered, they seem to share a unique bond that the rest of us, perhaps, are not equipped to understand.

Although, I have often painted American aircraft, I have met far fewer American flyers. Thankfully, due to the generosity of American gallery owners, particularly Virginia Bader with whom I have attended shows on the *Queen Mary* at Long Beach and at various air shows across the United States, I have been able to meet some of the more famous including Capt. Robert "Punchy" Powell and Capt. Jim Brooks.

Occasionally, the Americans come to England and we have arranged for some, like General Don Strait and Major Al Rigby, to visit their old airfields. Now mostly derelict and reverted to farmland, many of the former bases are still accessible and what a privilege it was to explore the remains of the old control towers, buildings full of broken glass and ghosts. Never can the memories the pilots recall be more evocative than when standing on the exact spot where they once stood as young airmen. It's at times like that when I am filled with inspiration for paintings but also rather scared by the responsibility to do those men justice.



Photo courtesy of Nicolas Trudgian

Nicolas Trudgian with his recently completed commission for a collector in Vancouver, depicting the Red Baron over the Western Front in 1918. This painting is eight feet wide!



Drawing courtesy of Nicolas Trudgian

***For the North American Aviation Retirees Bulletin, Artist Nicolas Trudgian graciously contributed his drawing of "Punchy" Powell's P-51, titled* "Beating up Bodney".**

People often ask me where ideas for pictures come from and talking with aircrew is certainly a major source. I once asked Gunther Rall of JG 52 how low he flew his Me 109 during the Battle of Kursk and his answer was, *"Low enough to cut the grass!"* That one comment inspired my picture *'Kursk—Clash of Steel'*. Surprisingly, and often seemingly coincidental, the most important and dramatic events in a pilot's life took place in grey overcast weather over uninspiring landscapes. Also, surprisingly often, the pilot will permit me the artist's license to provide a miraculous shaft of sunlight and a geographic land feature to liven up the scene! But without his blessing, it's harder for me to take liberties and it's this aspect of designing paintings that is the perennial sticking point. I want the pictures to be both accurate and artistically appealing, two things that are not always compatible.

Sometimes, I am told what to paint, usually a particular aeroplane or squadron, and then I need to find a setting that would best show off the subject. My German publisher asked me to paint a certain squadron. *"Doing what?"* I asked. *"You decide!"* he gruffly retorted like only a German can. *"You're the artist, that's what I pay you for!"* Although his attitude is very welcome, little does he realize that giving an artist that sort of freedom is very dangerous because we are liable to follow any flight of aesthetic fancy.

You see, artists are, by nature, self-indulgent creatures, easily distracted by a play of light, a happy combination of colours, or an exciting arrangement of shapes. For that reason I would have been a hopeless fighter pilot. Not only am I not keen on heights and a terrible shot but the views from aloft are endlessly captivating to someone with an artistic eye. I would have been shot down on my first mission while admiring a particularly attractive cloud.

But, when it comes to a painting, a whole composition can be built around an aesthetic feature like a cloudscape, a sunset over an estuary, mist hanging in a jungle valley or sunlight sparkling on snow-clad peaks. These visual delights may only provide the backdrop to the main act-the aeroplanes themselves, but they tend to be the things that attract collectors first. *'The 300 Club'* was one of my more popular prints which is not surprising as it featured the two highest scoring aces of all times, Hartmann and Barkhorn. But I've lost count of the number of collectors who said that it's the lake below, covered in shattered ice, that first attracted them to the print. I happened to be browsing through a book about Canadian railways and found a wonderful photo of a half-frozen lake. In my mind's eye, I moved it a few thousand miles eastward, called it the Eastern Front and wondered what exciting aircraft would suit this dramatic setting. What better than Erich Hartmann's black tulip-nosed Me 109, a sure winner!

Other purely aesthetically conceived paintings have been inspired by things as diverse as chewing gum commercials on the TV, Harry Potter movies and an episode of Xena Warrior Princess, the latter idea eventually becoming my *'The Cold Front'*.

Once all the planning and research have been done, painting the picture is relatively straightforward. I love to stretch my own canvases and the white expanse of them still gives me the same thrill as when I first started painting as a child. I surround myself with as much photographic reference material as possible and good quality models too. If it's possible and economically viable to visit the actual sites where the military action took place then I certainly do but in most cases books and DVDs suffice. I usually start by painting the national insignia on the aeroplanes, the roundel, cross or star, and then work outwards from there.

Other artists think me strange, they prefer instead to build up the picture in broad layers of colour but, my former days as a commercial artist taught me to paint in a more direct way, virtually finishing each part before moving on to the next. My work days usually start in the afternoon and I paint until midnight under a special colour-balanced light. I work better at night when there are fewer distractions. And so, typically, five weeks are spent trying to turn a flat white surface into an exciting three dimensional scene full of mood, colour and life. It's an endlessly fascinating challenge but one I never quite meet. But it's the striving for it that is such a pleasure.

World War II was mostly photographed in black and white and so paintings offer an opportunity to recreate events that not only would have been impossible to record at the time but in full colour as well. I hope in some small way, therefore, that my paintings keep the memories alive in a form that gives new generations a chance to see what their forefathers did for our freedom.

About the Author: Nicolas Trudgian, a world-class aviation artist, was born and raised in the English port city of Plymouth. His father, an RAF veteran of the North African campaign, recognizing Nick's artistic talents as a boy, encouraged him to fill sketch books with drawings of the planes, ships and trains that were all around him in that vibrant city. Nick soon dreamed of becoming an artist and after completion of five years at art college, his abilities led him to lucrative commissions with major industrial giants as a commercial illustrator. Welcome as this was, the things he was asked to paint were often far removed from his favorite topics. Nick still yearned to paint those subjects and so, in his spare time, he produced oil paintings of aviation, railroads and landscapes. Learning of Nick's ambition, the world's foremost aviation art publisher commissioned him to produce a vast piece of artwork to commemorate the Seventy-fifth Anniversary of the Royal Flying Corps and Royal Air Force in 1987. This proved to be the start of a whole new career as an aviation artist that to date has resulted in more than 170 full-size color limited editions and many hundreds of detailed pencil drawings. Nick has his own fresh style, combining accurate portrayal of the aircraft against a highly detailed background, which makes his works so individually distinctive. Adding to this aura of history, he resides with Ruth in the Cotswold hills in Gloucestershire, England in a house that very fittingly is located on the corner of what was once a Battle of Britain airfield. We are very grateful to Nicolas Trudgian for his enthusiastic participation in our humble endeavor.

NICOLAS TRUDGIAN
WORLD-RENOWNED AVIATION ARTIST
Aviation, military & railways • Paintings, pencil drawings, limited edition prints


"The Mighty 100th" by Nicolas Trudgian

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Apollo 12 Mission – A Shock!

by Larry Korb

Introduction

With the success of the Apollo 8 mission which circled the Moon and the subsequent exciting landing on the Moon by Apollo 11, there was confidence that the Apollo had matured. But, in the next few missions we encountered unexpected problems that challenged the very fabric of our space program.

Launch

Apollo 12 was launched nearly four months after Apollo 11 on November 14, 1969. The Mission Commander was Charles "Pete" Conrad and the Lunar Pilot was Alan Bean. The Command Module Pilot was Richard Gordon. The mission objective was to land in a site in the southeastern section of The Ocean of Storms, presumably a less rocky area than encountered by Apollo 11. In this area, they were to visit Surveyor 3, which had scouted the area and landed 31 months earlier. They were to remove and return parts of Surveyor 3 for further analysis.

The launch occurred during a rainstorm. Thirty-six seconds after lift-off, it was struck by lightning and 16 seconds later it was struck again. While the Apollo was designed to avoid damage due to a lightning strike, a strike had never happened before. Protective circuits on the three fuel cells shut down to protect against a current surge, taking all three fuel cells off line.



NASA Photo

Apollo 12 lifts off from Pad A, Launch Complex 39 at Kennedy Space Center.

Inside the ship, everything went dark, then the cockpit instrument panel lit up like a Christmas tree. Every warning light came on. Pete Conrad remarked, *"We had a whole bunch of buses drop out. Where are we going? I just lost the (stable) platform."* In the process, the navigational guidance and control was knocked out. The spacecraft was accelerating outwards and there was no stopping it. Fortunately, the Saturn V was operating without a problem to either the propulsion or the guidance and control. The crew was given a "GO" for staging and separation from the first stage of the Saturn V launch vehicle. Immediately, John Aaron, the NASA flight controller for the Command Module Electrical, Environmental and Consumables Manager (EECOM) discovered what happened!

Aaron made the call, *"Try SCE to Aux"*. The switch was fairly obscure and neither the Flight Director, CAPCOM, nor Commander Conrad recognized it. Aaron's quick thinking and Alan Bean's memory saved the day. Alan Bean, flying in the right seat as the CSM system engineer, remembered the SCE switch from a training incident a year earlier when the same failure had been simulated.

Pete was asked to switch to the secondary data system so that the telemetry would show the status of the electrical system. They were then switched to emergency batteries and, when the electrical system was shown to be satisfactory, they reset the main circuit breakers for the fuel cells.

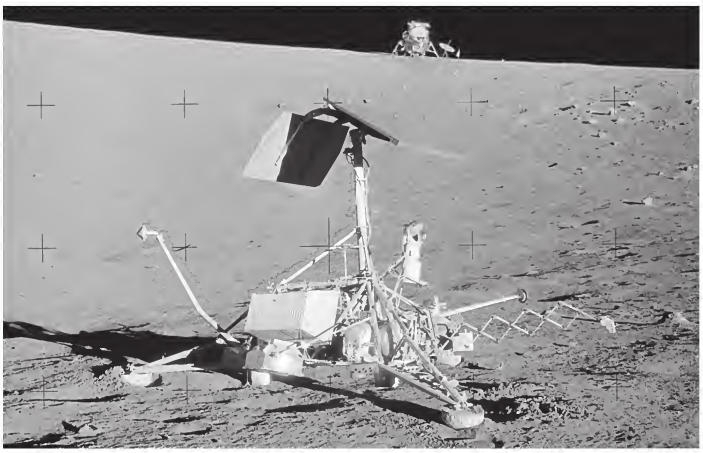
But they were not "home free" yet. Every guidance, navigation and computer control system had to be reset before firing the Saturn. Further, the programs had to be checked out and validated by Mission Control. Engineers felt that the odds were 100 to one against a lunar landing, but diligently worked the problem. After an orbit, everything was corrected and they were able to fire up the 3rd Stage and take off for the Moon.

Some engineers feared that the lightning strike may have caused the Command Module's parachute mechanism to fire prematurely, disabling the explosive bolts that open the parachute compartment to deploy them. If so, the Command Module would crash at high speed into the ocean, killing the astronauts. There was no way to figure this out ahead of time so the ground controllers decided not to tell the astronauts about the possibility. Fortunately, the parachute deployed perfectly.

Lunar Landing

Conrad planned to land within 600 feet of Surveyor 3. He guided the LM *Intrepid* to a near perfect landing using a Doppler-effect radar technique which was developed for future Apollo pin-point landings. While it was planned to land 600 feet away from the Surveyor, Conrad actually landed 580 feet short when he saw that the landing site looked rougher than anticipated. Thus, their walk was 1,180 feet to the Surveyor.

Pete remarked how anxious he was to pick up some rocks that waited 4.5 billion years for this landing. Pete remarked, *"Holy cow, it's beautiful out there!"* Pete was the smallest of the astronauts, 5'-6" tall, and then remarked, *"That may be one small step for Neil, but it was a long one for me."* He actually had a $500 bet with a reporter, Oriana Fallaci, that he would say these words. He claimed he was never able to collect. So much for trusting the Media.



NASA Photo

Surveyor 3 stands a short distance away from the Lunar Module* Intrepid *on the Moon's Ocean of Storms.

Pete and Alan made two 4-hour excursions from their lunar lander, deploying scientific instruments and collecting 75 pounds of rocks and surface material. Their equipment would measure seismic activity, solar wind flux, and the lunar magnetic field and relay these data to Earth. Their instruments were part of the first completely powered ALSEP station set up by astronauts on the Moon to relay long-term data. When on the surface, Pete remarked, *"Dust got into everything. You walked in a pair of lunar dust clouds kicked up around your feet."*

A color camera was sent on this mission but Alan Bean accidentally pointed it at the sun while trying to set it up, destroying its SEC tube. To make matters worse, Alan took many photographs, but left several rolls of film on the lunar surface. He might be a great astronaut, but he is a lousy photographer.

Their boots and pant legs were covered with dust so thick that it clung to their suits even when they returned to the lunar module and they kept their suits on inside it. They contacted the Surveyor and found it was covered with dust from the blast of the landing engines which sent a cloud out over 1,000 feet.

Return Trip

The blastoff of the ascent stage of the Lunar Module *Intrepid* went perfectly, as did the hookup in lunar orbit with the *Yankee Clipper*, the Apollo spacecraft. The ascent stage was dropped on the lunar surface and the seismometers left by the astronauts registered the vibrations for more than an hour. The astronauts had stayed on the lunar surface for 31½ hours and had a total time in lunar orbit of 89 hours. On the return trip, they witnessed a solar eclipse and took pictures of it.

When the Command Module returned to Earth, it landed 500 miles east of the American Samoa Island, and it was picked up by the *USS Hornet*. During the splashdown, a 16 mm camera dislodged from storage and struck Alan Bean in the forehead, rendering him briefly unconscious. He suffered a mild concussion and needed six stitches. Perhaps, Alan finally learned respect for cameras on this mission! Other than that, the mission was considered an outstanding success.

There was, however, one minor error. On the way to the Moon, after the Lunar Module separation, the Saturn S-IVB was intended to fly into a solar orbit. The stage's auxiliary propulsion system was fired and the remaining propellants vented to slow it down and fly past the Moon's trailing edge. However, a small error in the S-IVB guidance system caused it to fly past the Moon at too high an altitude to achieve escape velocity and it ended up in a semi-stable Earth orbit after passing the Moon on November 18, 1969. It finally escaped Earth orbit in 1971, but was briefly recaptured in Earth orbit some 31 years later and discovered by an amateur astronomer, Bill Yeung. Where is it now? I don't know.

About the Author: What can possibly be said about Larry Korb that hasn't been said many times before. As is common with the Bulletin, it is either too much or not enough material for the issue being assembled. We came up short almost two pages. I called up Larry and two hours later we had this incredible story about Apollo 12. This came so late there was no time to mention it in the Commentary! Instead, we named him our Science Editor!

"Gravitation cannot be held responsible for people falling in love. How on earth can you explain in terms of chemistry and physics so important a biological phenomenon as first love? Put your hand on a stove for a minute and it seems like an hour. Sit with that special girl for an hour and it seems like a minute. That's relativity."

— Albert Einstein

Air Force Museum Approves NAA Memorial Bench

by Ed Rusinek

From: "Greaser, Leslie K Civ USAF AFMC NMUSAF/MUS"
<LESLIE.GREASER@wpafb.af.mil>
To: <kenisure@socal.rr.com>
Cc: "Leach, Jane M Civ USAF AFMC NMUSAF/MUS" <Jane.Leach@wpafb.af.mil>
Sent: Tuesday, October 16, 2012 11:26 AM
Subject: Memorial for North American

Mr. Rusinek

The request by the North American Aviation Retirees has been reviewed and because North American does have a rich history with the Air Force, we believe it is most appropriate that we approve North American's request to place a memorial bench or plaque in the Memorial Park at the National Museum of the USAF.

The content of the memorial must reflect the connection of North American to the Air Force by, for example, listing the aircraft manufactured for the Air Force. Also, the request to place the logo on the memorial was approved by the Air Force legal office.

The next step, as outlined in the package that Jane Leach sent to Mr. Leatherman, will be to submit a draft drawing of the memorial for approval. After Jane receives this, she will send the package through the committee for approval of the content (text and drawings).

If you have any questions at all about the memorial, a dedication ceremony and/or a visit by the retiree association, please contact Jane and she will be most happy to help.

Leslie K. Greaser

LESLIE K. GREASER
NMUSAF/MUS

E-Mail Received by the North American Aviation Retirees Bulletin from the National Museum of the U.S. Air Force

Our Nolan Leatherman has carried our quest to the goal line, it is up to us to score the goal! He met the marble contractor and the cost is approximately $6,500.00 and will take about five months to complete. The cost is high but not unattainable. The Bulletin has tapped out most of its reserve funds to endow the Achievement Awards at the USAF Academy for perpetuity. Hence, we must turn to our friends and subscribers to help in this endeavor, including those in the Silent Majority. We propose to use the centerfold in future issues to list the name of all donors, division affiliated, and home town. If you wish to donate in memory of a family member or friend, your name, division affiliated will be followed by, "in memory of (Name and Division affiliated)". To recognize all members of the NAA Family in this memorial, all Divisions will be included with the NAA Logo. If you are planning to renew your subscription at this time, **do not combine** the subscription fee with the contribution. Please send separate checks made out to the **Bald Eagles Inc.** because they will be deposited in separate accounts. We know that our ranks are thinning out, but, if possible, stay healthy and come to the dedication ceremony next Spring!

Our graphic artist, Bryan Hori, has already created the design for our NAA Memorial Bench in compliance with the instructions provided by the Museum.



Contrails From The Past

by Ed Rusinek

Dear Ed,

Just to keep you up to date with my activities! Turned 93 in September and still active with golf and bowling but doing less travel. Sure appreciate the Bulletin. You folks cover it all.

— Andy Anderson, Signal Hill, CA

Ed's Ans.: Andy, just keep rolling those strikes and chasing Par and let's hear from you when you're 94. God Bless.

Dear Mr. Rusinek,

Thank you so much for seeing to it that my mother's obituary was so nicely done. This issue included several astronauts and Dr. von Braun, all of whom my mother knew from her long career in aeronautics and space. She would have been thrilled to see her obit adjacent to that of two astronauts.

I am proud of my mother. She passed on to me the way she lived her life—Personal Responsibility in Daily Effort.

— Kate Cameron Froeberg, DVM, Sunnyvale, CA

Ed's Ans.: It is obvious that the Acorn didn't fall far from the Oak tree.

Dear Ed,

Excellent articles in the Fall Issue. I learned more about the Moon and its influence on Earth than I ever knew existed. Decided to become a Silver Eagle and be covered for Life.

— Jake Borrer, Columbus, OH

Ed's Ans.: Reading Larry Korb's articles is a liberal education in Astronomy, Chemistry, Geology, Metallurgy, Astronautics, Aeronautics and Space History.

Dear Ed,

I retired from Rockwell International but my technical career started in Downey in the 1950s. I was assigned to the Research & Development Department of Autonetics. Our task was to test and evaluate the performance of our navigation systems, one of which was intended for the X-10.

My question is: why is there no mention in any space publication of the contribution made by NAA. Even with the end of the Space Shuttle program, there is nothing about NAA! I think that credit is long overdue!

"Mahalo" and "Aloha".

— Lawrence Tanimoto, Keaau, HI

Ed's Ans.: First, thank you Larry for the nice check! North American Aviation has been neatly sanitized out of most reports and historical accounts and our achievements are now attributed to those that took over the company whose only objective was to make a fast buck. Fifty years after our name, North American Aviation, disappeared, we are all that is left of that grand "old" company. We only existed a short forty years, yet we achieved fantastic accomplishments in the oceans, the skies and outer space. I was asked why I didn't watch the last flyover over Southern California of the Shuttle atop the 747. I couldn't because my heart would break!

Dear Ed,

At 15, I was introduced to the Space Program à la Mom who had recently separated from Dad and had her first job as a receptionist at the Tahitian Village in Downey, a Polynesian themed hotel/motel on Lakewood Boulevard just down the street from the NAA Downey facility. It was there I met John Glenn, Don Eisele, Dick Gordon and many other Apollo astronauts during those high school summers when I baby sat for the owners who lived onsite with their infant daughter. I also provided switchboard relief in the motel lobby. When the board would light up all at once, managing all those plugs and cords was like an E-Ticket ride! My brother also worked summers as a stock boy in the liquor store that was onsite plus several of our friends worked as waiters and busboys...some of their stories were hysterically funny! The adult stories I remember hearing were sometimes over my head.

I remember the stories the astronauts told, boarding at the Tahitian Village when they came to inspect their Apollo modules at the Downey facility. The annual end of summer luau used to bring in everyone from NASA high rollers to subcontractors and never lacked for a bevy of beautiful women. It was quite a party with the Polynesian dancers and flame throwers. The luau would end when several fully dressed adults started throwing each other in the pool which was quite a sight.

In 1975, I was hired by Rockwell International. The absolute thrill of it! I was so proud. Aerospace was believed to be the industry one could work a solid 25-30 years and be guaranteed a fulfilling career, a generous retirement and a gold watch! All you had to do was get a foot in the door. I hired in as a Messenger to Ed Smith who was Chief Engineer and Vice President of Engineering on the Space Shuttle Program. I was a grunt but I didn't care. I was in the door and thrilled by the prospect of working in Engineering my entire career.

Exposure to that level of advanced technology, innovation and creativity was thrilling to say the least.

I worked hard to hone my skills, taught myself alphabet shorthand and within a year, I was working as a group secretary in the Shuttle Project Office for Bill Beckner and his project engineers. I don't know how many hundreds of documents I typed but what I remember were those damn carbon copies. The letters prepared for NASA had to be typo free and dealing with the carbon paper was challenge enough but the pressure of knowing that you cannot make even one typo afflicted me with paranoia!

I am honored and privileged to have been amongst these great men and women who were putting their scientific and mathematical genius to this grand effort. Dedication went without saying as we worked hard and sometimes extremely long hours to achieve success, to make our nation proud but, most importantly, to benefit mankind. The toil and lives sacrificed to achieve success was profound. I carry with me the incredible sense of pride and accomplishment from my aerospace days and I miss them tremendously. I believe that everyone who made a contribution to the Space Program, be it large or small, will attest to this.

Last week, as I received email upon email with photo attachments of *Endeavour* on its final journey to L.A., I cried. I could not allay my sadness. The finality of it, the vast and cherished memories of my life in aerospace flooded my consciousness as I walked with a heavy heart the entire day and night. The travesty that these glorious birds will never take flight again was overwhelming and I found myself grief stricken. That we have snatched away from our children and grandchildren a solid jumping off point to pursue future space exploration and discovery is a crime!

I am forever grateful for the skill set and, especially, the work ethic that I was taught in the aerospace environment. Corporate America today is nothing like it was then. Sadly, today's corporate culture is barren of humanity with a strong work ethic practically non-existent. The lessons learned have served me well and allowed me to advance my administrative career to the highest levels over the course of nearly 40 years.

Rockwell International was my college education, my family of sorts and a most cherished career accomplishment that I shall never forget.

Lastly, I sincerely thank you and your staff for continually providing readers with history lessons of the past as well as informative articles of present and future projects. The fee for my bulletin renewal is enclosed. With warmest regards and appreciation.

— Vivian Steiner, Costa Mesa, CA

Ed's Ans.: Vivian, from the business card you enclosed, I see that you are the Senior Coordinator, Worldwide Quality Assurance for a major company. You have come a long way from the 15 year old that was the relief switchboard operator at the Tahitian. In your letter you have captured all of the initiative, ingenuity and dedication to our Country that we all had working for the greatest aerospace company that ever came into being only to disappear like a meteor streaking across the sky!



NASA photo/Jim Ross

Escorted by a NASA F/A-18 chase plane, the Space Shutlle* Endeavour *and the 747 Shuttle Carrier Aircraft begins its final approach to Los Angeles International Airport at the end of the Endeavour-SCA Tour of California on September 21, 2012, marking the end of over 30 years of Space Shuttle flight.

The Silent Majority

by Stan Guzy

MERRICK, GEORGE B., 84 – of Manhattan Beach, CA passed away on September 21, 2012. After graduating in 1949 from the University of Minnesota with a B.S. Degree in Aeronautical Engineering, he joined NAA and served for 43 years in which time he advanced to leadership roles on the X-15, Apollo and Space Shuttle Orbiter. George retired in 1991 as Corporate Vice President. He is survived by his wife of 61 years, Ellie.

VUCELIC, MICHAEL (MILOJKO) "MIKE", 82 – passed away at home in La Jolla, CA on September 7, 2012. Mike grew up in war torn Zagreb, Croatia where he earned degrees in aeronautical engineering, learned to fly and mastered four languages, including Russian. He escaped General Tito's communist Yugoslavia and joined Mercedes-Benz in Germany. Immigrating to America in 1956, he worked for Cessna and Stanley Aviation before coming to Space Division in 1962. His engineering skills and management style led to leadership roles in Apollo systems integration and mission control followed by management on the Apollo-Soyuz program. His final assignment was with the NAR Corporate Office International Development team in Pittsburgh. He retired in 1982 with 20 years of service. He is survived by his loving wife Inge.

BELL, M. W. '"JACK", 88 – passed away on June 12, 2012 after a prolonged battle with Parkinson's disease. Joining NAA in the 1950s, he was immediately recognized for his special skills. He was assigned to Advanced Engineering and worked on many "black" programs. He retired in the mid 1990s after more than 31 years of service at the Space Division and Seal Beach facilities. He lost his beloved wife of 46 years, Janell, in 1996.

BRADY, NORMAN C., SR., 92 – passed away at home in Seal Beach, CA on August 31, 2012. Norman came to NAA-Rockwell in 1968 after a long career at Glenn L. Martin Co. He worked on the Apollo, Skylab and Shuttle programs before he retired in 1982. He is survived by his wife of 70 years, Mary Ellen.

BRUSTO, STANLEY B., 82 – of Mead, CO passed away on September 12, 2012. After service in the U.S. Army, Stan joined NAA in 1952 and retired as a manager in 1987. He enjoyed softball and camping. He was preceded in death by his loving wife Elaine.

CANNING, JAMES "JIM", 95 – departed peacefully at UCLA Medical Center on August 12, 2012 after suffering a stroke. Jim worked as an engineer on many projects but he was proudest of the X-15 Program. He was a performing member of the NAA Flying Horsemen. He retired from LAD in 1967 with 21 years of service. His wife, Angie, preceded him in death and he is survived by his companion, Mary.

CARUSA, RICHARD, 83 – passed away on October 4, 2012 in Artesia, CA. Dick joined the U.S. Coast Guard during the Korean War and met his wife on Saipan in 1953. Discharged, he came to NAA as a test engineer on the inertial guidance systems projects, retiring after 35 years.

CIACCIA, PAT, – of Scotts Valley, CA. NAA Bulletin returned stamped "Deceased". Pat retired from Space Division in 1985 with 37 years of service.

DUVALL, JERRY, 68 – died on April 7, 2012 from an unknown lung problem. He retired in 1982 with 30+ years of service at NAA.

HODGES, VERNON W., 82 – of Lancaster, CA passed away on November 12, 2012. Vernon graduated from the Virginia Polytechnic Institute with a B.S. Degree in Mechanical Engineering and, subsequently, earned an M.S. in Systems Management from USC. He entered the USAF and realized his dream when he became a jet fighter pilot flying F-86 Sabres with the 366th Fighter Bomber Wing at England AFB, Lousiana. Retiring as a major, he began a second career in Aviation serving on several defense programs including the B-1 Bomber. He is survived by his wife Emily.

JONES, GORDON, 71 – of Anacortes, WA passed away on August 25, 2012. Gordon served in the U.S. Navy aboard the *USS Oriskany*, CV-34, before coming to Space Division in 1961. He served for 35 years on the Apollo and Space Shuttle programs before completing his career as Manager of Quality Control on the GPS Satellite Systems program at Seal Beach. Gordon was always a friend and a good Samaritan when someone needed help. He is survived by his loving wife of 32 years, Vera.

KLASKY, SHIRLEY B., 86 – passed away on October 20, 2012 in Huntington Beach, CA. Shirley was a very professional secretary, assigned to management at Space Division. She retired in 1985 with 23 years of service.

LASSEIGNE, ALBERT "AL", 91 – died on June 18, 2012. Al had served as a Leadman in the Tool & Die shop at LAD for many years before rising to the position of Tool Engineer. He retired in 1979 after 39.5 years of service and is survived by his wife of 50+ years, "Bert".

LAWRENCE, CLIFFORD C. "CLIFF", 94 – passed away at home in Yucaipa, CA on October 12, 2012 of Alzheimer disease. Cliff joined LAD in 1936 and was assigned Employee Badge No. 2727. He served on the P-51, B-25, F-86, Navaho, Hound Dog, Apollo, Saturn and B-1A programs before retiring in 1973. His son, Roger, also served at NAA/RI. He had Employee Badge No. 446098.

LEWIS, PAUL V. – of Prescott, AZ passed away on October 31, 2012 surrounded by his family. Paul had a wonderful 37 year career with Rocketdyne when he retired in 1995. He is survived by his wife of 47 years, Sharon.

MERZ, LEROY, H., 94 – died on September 26, 2012. Obituary indicates he was a WWII Navy veteran and a NAA/RI retiree. He is survived by his wife, Anna Mae.

MEYSER, JOSEPH B., 105 – of Escondido, CA passed away on August 12, 2012. Joe joined NAA at LAD in 1938 as Chief of the Data Section in Engineering. At the time, the first BT-9 contract was awarded and the company had over 1,000 employees. Upon reorganization in 1940, he became the Assistant Corporate Director of Contract Administration. He retired in 1954.

MORIN, DALE A., 79 – of Wolf Point, MT passed away in his sleep while travelling from Montana to Arizona. He had been diagnosed with ALS and was moving to live with his daughter, Angelina. Dale joined NAA as an accountant on the Sabreliner and Space Shuttle programs. He retired in 1995 with 35 years of service. He is survived by his wife of 58 years, Joy.

NUTZMAN, E. "SWEDE", 89 – of Prescott, AZ passed away on October 8, 2012. Swede had served in Field Service on the AJ-1, T-28, B-45 and the Apollo programs for 33 years when he retired from Space Division in 1981.

PACE, WILLIAM A. "BILL", 95 – of Rolling Hills Estates, CA passed away on September 21, 2012 after heart surgery, his loving wife of 73 years, June, at his side. Bill enlisted in the USAAF in 1942 and served as a B-24 pilot. He was shot down over Slovakia and was captured by the Germans. He was held in a POW camp at Barth, Germany until liberated by the Russian army. He and his wife joined NAA in 1951, Bill in Armament Design and June in Flight Test. He worked on the F-86, F-100, XB-70, X-15, B-1A and B-1B. They both retired in 1984.

PAULINO, CAROLE, 67 – a good friend and colleague slipped the surly bonds of this earth on September 22, 2012 after a prolonged battle with cancer. She fought the good fight but the dreaded disease eventually took its toll. Carole joined NAA/RI in 1962 and progressed through the ranks of management, retiring as Manager of Customer Relations after 40 years of exemplary service. Her entire career was spent on the Apollo and Space Shuttle programs in Material, Manufacturing, Engineering/Logistics and Customer Relations. She had been designated as a Launch Honoree and received a Silver Snoopy award along with many accolades from the Customer. Carole was truly a beautiful person with a good heart.

REARDON, PHILLIP D., 96 – an aircraft pioneer, Phil died in Manhattan Beach, CA on May 9, 2012. He left the Army Air Corps in 1939 and worked at various small airports in the San Joaquin Valley as a mechanic. During World War II, he joined NAA and served in Field Service as a Field Rep on the P-51 fighter, B-25 bomber and T-6 trainers in the China-Burma-India (CBI) Theater including Tripoli, Casablanca, Tunis, Karachi, and Calcutta. He retired in 1976 as Director of Logistics and Support with 34 years of service. He went on to modification of P-51s for speed and range. He is survived by his ex-wife and good friend, Sarah Aspel, and long time companion, Helen Pares.

ROUSE, ANITA C., 94 – passed away at home in Chatsworth, CA on September 28, 2012. Anita retired from Autonetics as a Senior Accountant. She enjoyed world travel, gardening, Las Vegas and the theater. She was a much loved lady.

SELLECK, BARNEY A., 89 – of Rolling Hills Estates, CA passed away on August 27, 2012. Barney retired from Sabreliner Division in 1981 with 35 years of service. He is survived by his loving wife Merial.

SMITH, CHARLES V., 80 – passed away peacefully on September 30, 2012 in Murrieta, CA with his family by his side. Chuck was civic minded, serving as Orange County Supervisor (First District), Mayor of Westminster, CA and founding chairman of the Children/Families Commission of Orange County. After serving in the United States Marine Corps and earning a B.S. degree in Electrical Engineering, he served for 32 years at Autonetics before retiring. He is survived by his beloved wife of 52 years, Nancy.

SMITH, HAROLD R. "SMITTY", 86 – of Tehachapi, CA passed away on August 19, 2012. Harold was a design engineer at LAD in the Landing Gear Department assigned to many projects including the B-70 and B-1. He retired in 1985 with 37 years of service and joined Northrop on the B-2 program.

SMITH, LEE M., 74 – after a long struggle with heart disease and cancer Lee passed away on September 11, 2012. He retired from NAA/RI after 30 years of service as a mechanical engineer. He is survived by his loving wife of 49 years, Sherry.

SPRAGUE, RICHARD E. "DICK", 89 – of Salida, CA passed away on October 4, 2012. After serving in the U.S. Army Air Forces as an aircraft mechanic, Dick had a 37 year career with NAA as a Facilities Engineer. He retired from Corporate Offices in 1979.

STRUBE, EUGENE G., – passed away peacefully on October 3, 2012. After being deployed to Japan with the U.S. Marine Corps, he graduated from Northwestern University as an electrical engineer. He served with several aerospace divisions including Autonetics as a systems engineer on Minuteman III ICBM, S&ID as a field engineer and maintenance engineer on the Apollo and the B-1B Lancer.

STARK, MAX, 92 – of Wildomar, CA passed away on September 22, 2012. Max served on the Apollo and Space Shuttle programs for 25 years before retiring from Space Division. He is survived by his loving wife Carolyn.

UPTON, EUGENE, 83 – died on September 26, 2012 in Westminster, CA. He retired from NAA/RI with 40 years of service. He is survived by his extended family.

WARNER, WILLIAM J. – of Palm Springs, CA. Bulletin returned stamped "Deceased". Bill retired from the Satellite Systems Division in 1987 with 28 years of service.

WENDT, SAMUEL F., 86 – passed away on September 27, 2012. Sam served in the Naval Construction Battalion in WWII as a Seabee on many Pacific islands. He retired from NAA/RI Columbus Division in 1987 after 33 years of service. His devoted wife, Jane preceded him in death.

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North American Aviation Retirees Bulletin
"Where The Best Never Rest"

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IF THE DATE ABOVE YOUR NAME IS DECEMBER 2012 AND YOU HAVEN'T YET RENEWED –
THIS IS YOUR LAST ISSUE!



Painting by Nicolas Trudgian, courtesy of the Artist

P-51D Mustangs of the 31st Fighter Group operating out of the Foggia, Italy region included the 307th Fighter Squadron led by our NAA Test pilot, Captain James Brooks. Based on incorrect Intelligence, Captain Brooks led his squadron on 22 July 1944 from Italy to Poltava, Russia and from there to Mielic, Poland to attack a Luftwaffe aircraft center supposedly repairing captured American aircraft. None were found but on the return to Poltava, the squadron encountered the famous Ju 87 Stuka Group led by Hans Rudel attacking an advancing Russian column. The squadron destroyed 27 out of the 30 Stukas. Returning to Italy on 26 July 1944, the squadron had flown 3,200 miles, destroyed over 40 enemy aircraft and inflicted major losses to enemy ground forces without the loss of a single pilot or aircraft. This warrior spirit of the 31st Fighter Group on evening patrol is captured by renowned British Aviation Artist Nicolas Trudgian in his painting 'Mustangs Over The Mediterranean'.

NORTH AMERICAN AVIATION
Retirees Bulletin

"Where The Best Never Rest"

Spring 2013

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Photo Courtesy of Boeing History Archives Office

Incredibly, shortly after the attack on Pearl Harbor on December 7, 1941, the Japanese had invaded and conquered vast land areas with no means available to halt their aggression. President Franklin D. Roosevelt turned to his generals and asked them to find a way to attack Japan's homeland as quickly as possible. Based on a chance observation that it would be possible to launch twin-engine Army bombers from an aircraft carrier, Lt. Colonel James H. Doolittle was selected to lead the forlorn mission. On April 18, 1942, sixteen volunteer-crewed North American Aviation B-25 Mitchell medium bombers took off from the new carrier* USS Hornet *and succeeded in bombing Tokyo and Nagoya. Although the damage was trivial, the impact of the raid was devastating. Upon his return to the USA, Jimmy Doolittle stopped at the NAA Los Angeles Division to thank the employees for the splendid aircraft they provided.

NORTH AMERICAN AVIATION
Retirees Bulletin

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Dear NAA Retirees Bulletin Subscriber

Bravo! Bravo! Bravo! As I write this commentary to you today, I am profoundly humbled by the response we received to the announcement that the USAF granted us permission to sponsor the North American Aviation Memorial Bench at the USAF Museum in Dayton, OH. Almost as quickly as the Winter Issue went out, the checks and words of heartfelt support came back. The strength and spirit that made up North American Aviation Inc. so many years ago lives on in the hearts and minds of you, the wonderful, wonderful Retirees of North American Aviation! We were hoping to raise the funds in three months. We must have had a momentary mental lapse, we forgot that members of the North American Aviation family do things with panache! We achieved and overran our goal in less than four weeks. Adding to this emotion, were the names of those remembered in this cause! With grateful pride, we present the donors for this gallant quest in the centerfold. God Bless Them and All Remembered!

With this issue, we begin our fourteenth year as castaways from Boeing when we became totally reliant on your support. All of you Silver Eagles that joined us in the earlier years are now getting your copies for FREE! However, sadly, as the years slipped away, many of you have left us and are not here to enjoy this happy milestone.

Encouraged by the P-51 painting by Nicolas Trudgian on the front cover of the Winter 2012 Issue, "Punchy" Powell was going to provide the "Battle for New Year's Day" story for this issue. However, a family matter came up and he asked his good friend, Author and Marine Corps Fighter Pilot, Jay Stout, to provide this exciting chapter of the Blue Nosed Bastards of Bodney in Action again! This is one story you will not put down, even to sneeze!! Jay just completed the story of the Blue Nosed Bastards, the 352nd Fighter Group titled *FIGHTER GROUP.* If you enjoyed Punchy Powell's stories, you will love this book!

From the NASA Dryden Flight Research Center History Office at Edwards AFB, we introduce a new author, Curtis Peebles. He relates how a series of asteroids are named after the X-15 Test Pilots. In the process, he reminds us of these gallant men that risked everything to give America the lead in Space!

Finally, we have a fantastic story about the N-Ray developed by Atomics International that could have done a marvelous job in saving our soldiers by detecting horrible land mines as they approached them. However, the program was cancelled because some government paper shufflers saw no value in continuing the research. The question remains, did they even understand what they were dismissing? Our Cleve Kimmel provides a brief summary of this outstanding and unusual program!

When an "Outsider" picks up a copy of our Bulletin, I am often asked, "You always make it sound like North American Aviation was something 'special'. Weren't all the airplane companies about the same?" The answer is a definite "NO"! North American Aviation was built up by the visionary James "Dutch" Kindelberger and he imbued the company and the people with an attitude that everything is possible if you push on beyond that what you know is possible! Unfortunately, the leaders that followed lost that vision but the people never forgot! That is why we are different! That is why We Are The Best!

The Battle for New Year's Day

by Jay A. Stout, LtCol, USMC (Ret.)

Editor's Note: This was to be another "Punchy" Powell article. However, some family matters came up and, providentially, Col. Stout took over the task of providing us another gallant episode of the Blue Nosed Bastards of Bodney.

The German offensive in the Ardennes—better known as the "Battle of the Bulge"—began on December 16, 1944, and caught the Allies completely by surprise. German forces gained ground quickly and the Allies reacted by pouring ground and air reinforcements into the area. The 352nd Fighter Group, an England-based Eighth Air Force P-51 unit normally assigned bomber escort duties, was temporarily loaned to the Ninth Air Force to help stymie the German assault. The 352nd moved to an airfield codenamed Y-29, near Asch, Belgium, on December 23.

The initial German plan included a surprise air attack on Allied air bases. The American, British and Commonwealth air forces owned the skies over the western battlefields and no German assault could succeed without establishing at least temporary air superiority. Accordingly, the German concept—*Bodenplatte*—called for attacks against 16 Allied airfields simultaneous with the start of the ground offensive. In the event, foul weather kept aircraft from both sides grounded.

Although the weather cleared at times during the first two weeks, Bodenplatte was not initiated. However, with the Wehrmacht bogged down in a frozen stalemate toward the end of December, and with favorable weather forecast for the near term, the decision was made to try the attack in concert with a renewed push on the ground. Cryptic orders were sent to nine Luftwaffe fighter wings, or Jagdgeschwader.

Jagdgeschwader 11 (JG 11) was tasked to hit Y-29. It was headed by Major Günther Specht, a hard-bitten Prussian who nonetheless was not only respected but also liked by his men. He had been part of the pre-war Luftwaffe and by late 1944 had scored 34 aerial victories in the West, including 17 four-engine bombers.

Specht's JG 11 was a shambles at this point in the war. Indeed, during just the last half of December 1944, JG 11 suffered 142 aircraft destroyed or damaged and 33 pilots killed or unaccounted for. After years of fighting a war during which replacements were inadequate to keep pace with losses, there were few fliers left in the German Air Force that were experienced by American standards.

Detailed orders for Bodenplatte arrived at JG 11 on December 31, 1944. Exhaustive instructions, together with photographs of the target area, were intended to help make up for what the individual pilots lacked in experience. Following the briefs, the pilots were ordered to make the night an early one. At the same time the unit's ground crews continued to work at a frenetic pace through the bitter cold in order to get as many aircraft ready as possible.

The Allies were completely unaware of the German plan. Richard DeBruin, the 352nd's supply and transportation officer remembered that he and some of the other officers took advantage of an ad hoc bar that another unit, the P-47-equipped 366th Fighter Group, had set up at Y-29. *"After our evening meal on New Year's Eve, Meyer [John C.] said, 'Let's go over to the 366th area for one drink and then to bed.' I drove one of the Jeeps, and a group of us went for one drink. He [Meyer] appeared to be very calm that evening and one could imagine his thoughts were about the next morning."*

John C. Meyer was the squadron commander of the 352nd's 487th Fighter Squadron. He was an aggressive and no-nonsense officer and pilot who had been with the 352nd since its formation more than two years earlier. He was also the highest-scoring P-51 ace still alive. Meyer had a feeling that the Luftwaffe might try something on the first day of the coming year and was anxious to lead a patrol the next morning. He had been badgering higher headquarters for permission to do so, but had yet to receive it.

JG 11's pilots were up before daylight. Dawn, when it came, was icy cold. The pilots ate breakfast and received their final briefs while the ground crews struggled to make a few more aircraft serviceable. Ultimately, the various JG 11 units were able to get just more than sixty aircraft and pilots ready for the mission.

After getting his mixed group of Me 109s and FW 190s joined over Frankfurt, Specht followed two Ju 88 navigation aircraft west at about 0830. JG 11's route took it across the Rhine at Koblenz and over the front lines twenty miles east of Aachen. A few miles northeast of Asch, the two Ju 88 crews—their jobs complete—left the pilots of JG 11 to finish the route on their own. Now, at the head of the formation, Specht squinted over his left shoulder toward Asch and then took another look behind him at the men and aircraft that made up his Jagdgeschwader. A moment later, he led the formation in a sweeping left turn to the southwest and toward the target.



Photo courtesy of Sam Sox, Jr.

***Squadron Commander Lt. Col. John C. Meyer poses in the cockpit of his P-51,* "Petie 2nd".**

By that time Meyer was readying to lead the 487th on patrol-he had received permission a short time earlier. The unit history noted: *"Col. Meyer hit back for the 487th's ready room, picked 11 other pilots, and told them they were going with him-on a routine flight."* Meanwhile, the 352nd's maintenance men readied the group's P-51s for the day's missions.

Carl Galloway was Meyer's crew chief. *"When we arrived at Y-29 [on December 23],"* Galloway recalled, *"He decided to leave his chute in the plane. I suppose he thought it would save some time for a fast takeoff. Later, he asked me to take it to the operations hut after each flight and he would pick it up when he came out to fly."*

But on January 1, 1945, Meyer arrived at his aircraft without his parachute. He had forgotten it and sent Galloway after it. Upon returning, Galloway helped Meyer into it and followed him as he lowered himself into the cockpit. *"As we were getting straps in place,"* Galloway remembered, *"everything seemed normal. No rush. As I was standing there I looked to the east and what I saw must have frightened me. Colonel Meyer asked me, 'What's wrong sergeant?' I told him to look in his rear view mirror."*

What Galloway saw was the start of the German attack. *"When he, Meyer, saw that, he told me to jump,"* recounted Galloway. *"I heard him give the order to the others as he started the engine. There was no warm-up and he taxied out and took off at once."*

Meyer was in a hurry as were his pilots behind him. With his guns already armed and his gunsight on, he lined up on the runway, gunned his engine and rolled to the northeast. As he got airborne he slapped his landing gear handle up and spotted an FW 190 just above the trees crossing from his right to left. He made a mild heading change and fired his guns; the enemy fighter rolled inverted and hit in a flaming explosion. It happened so quickly that Meyer's landing gear doors hadn't even closed before he fired.

Ray Littge was one of the first pilots airborne. He climbed, but before he could join anyone, he found himself already in the fight. *"I picked out a 190 flying at 3,000 feet, and made one turn with it to the right. I got strikes on the wing roots and cockpit. He snap-stalled to the right, recovered, then snapped again, and hit the ground and exploded."*

Littge then chased after an FW 190 at low altitude. He scored a few hits and the German pilot maneuvered aggressively but to no end. Rather than fleeing toward Germany, the FW 190 pilot headed west with Littge—now out of ammunition—in pursuit. *"He took me almost to Paris,"* Littge noted, *"when he started climbing, and at approximately 3,000 feet, he bailed out in Allied territory."*

Marion Nutter was a 487th pilot who wasn't on the flight schedule that morning. He remembered the battle in a letter home to his brother Bob:

> *I was walking out of the operations tent about quarter of nine and heard someone holler, 'Hey, a dogfight!' and he pointed at the horizon towards Germany. There, zooming and turning just above the trees were P-47s, 109s and 190s going at it tooth and nail. The first thing we knew, the fight had moved right over our heads. My squadron, as luck would have it, had just then taken off and was already in the scrap... By then, two of our boys were on one of them and the Jerry almost spun in trying to get away. He recovered right on the trees and zoomed away from the field in a steep turn. Right there, one of our boys nailed him and he dropped his nose and went straight in a huge orange ball.*

Mustang pilot Henry Stewart got off to a slow start that morning. Soon after getting airborne, he climbed to give cover to his flight lead, but the antiaircraft fire was so heavy he had to turn away. *"When I broke, I ran into a 109. I made a few turns with him but could not get into firing position."* Stewart disengaged with the German fighter and immediately latched onto another: *"I followed another 109 up through the clouds at about 150 mph but could not close and almost spun out."* Having unsuccessfully turned with two German fighters, Stewart went after a third. *"I came back down and went around with another 109. I fired but did not observe any strikes."*

Notwithstanding, his lack of success, the hapless Stewart stayed in the hunt; he was nothing if not persistent. *"I then came back toward the field and tagged onto another 109 headed toward our field. I closed on him and pulled the trigger, nothing happened! My knee had shut my gun switches off. I got them back on and fired. I got a few strikes, we started turning over a slag pile and Capt. [William] Whisner came along and clobbered him."*



Photo courtesy of Sam Sox, Jr.

Two Me 109s of JG 11 strafe the 366th Fighter Group area during the attack at Y-29 on New Year's Day, 1945.



Photo courtesy of Sam Sox, Jr.

Ray Littge, on the wing of his P-51, talks with his Crew Chief, Ray Moeller. Littge was credited with 10 aerial victories while flying with the 352nd.

If Stewart was frustrated, he remained undeterred, and a few moments later his doggedness finally paid off. *"I came back toward the field again and saw two P-51s chasing a 109. The 109 broke, I cut my throttle and slid in behind him at about 100 yards and 100 feet off the deck. I fired and observed many strikes. The 109 went straight in and exploded."*

Stewart's success bred more success. *"I pulled up to 2,000 feet and started a turn. I saw another 109 on the deck headed East. I closed my throttle again and dove behind him. At 150 yards range I opened up and got many strikes on the wing root and fuselage. The 109 went straight into the ground."*

Stewart was on a roll. It was at this point that he spotted another P-51 tangling with an Me 109. Stewart recalled: *"I started back toward the field and picked up another 109 on the deck, -51 chasing him. The -51 broke and I dove down on the E/A, our alt being about 100 feet. He turned and I followed him East. I closed to 150 yards and fired, getting strikes all along the right side of the plane. Coolant came out and the 109 crashed into the ground."*

William Whisner—who had earlier shot down one of the fighters that Stewart had been chasing—remembered that the fight was a free-for-all from the very beginning. *"We didn't take time to form up, but set course, wide open, straight for the bandits."* Whisner spotted a large formation of FW 190s at 1,500 feet with a number of Me 109s above them. *"I picked out a 190 and pressed the trigger. Nothing happened."* In the mad scramble that morning Whisner had forgotten to arm his guns.

"I reached down and turned on my gun switch," Whisner recollected, *"and gave him a couple of good bursts. As I watched him hit the ground and explode, I felt myself being hit."* Whisner whipped his aircraft around in a hard climbing turn to the right and saw another FW 190—guns ablaze—very close behind him. *"As I was turning with him, another -51 attacked him and he broke off his attack on me.*

"I then saw that I had several 20mm holes in each wing and another hit in my oil tank. My left aileron control was also out. I was losing oil but my pressure and temperature were steady." Such damage would normally have compelled a pilot to turn directly for home, but Whisner was already there. *"Being over friendly territory I could see no reason to land immediately, so I turned toward a big dogfight and shortly had another 190 in my sights. After hitting him several times, he attempted to bail out, but I gave him a burst as he raised up, and he went in with his plane, which exploded and burned."*

Soon after knocking down the second enemy fighter, Whisner found himself engaged with a third, an Me 109. This fight taxed Whisner's skill and lasted much longer than was typical. *"We fought for five or ten minutes,"* he recalled, *"and I finally managed to get behind him. I hit him good and the pilot bailed out at 200 feet. I clobbered him as he bailed out and he tumbled into the ground."*

Calls came over the radio that the airfield was being strafed again and Whisner raced in that direction. *"I saw a 109 strafe the Northeast end of the strip. I started after him and he turned into me. We made two head on passes, and on the second I hit him in the nose and wings. He crashed and burned East of the strip."* Whisner chased after several more enemy fighters without success and finished the day with four confirmed aerial victories.

Nelson Jesup was one of the last 487th pilots to get airborne. He firewalled his engine and as the aircraft broke ground he raised his landing gear and nosed over slightly to accelerate just a few feet above the runway. It was then that he noted an Me 109 with a blue propeller spinner coming directly at him. An instant later, the German fighter passed close aboard down his left side only twenty feet above him.

At the edge of the airfield Jesup pulled the nose of his fighter nearly vertical then chased an Me 109 into the clouds before losing sight of it. He played cat-and-mouse with a couple more enemy fighters before spotting an FW 190 climbing into the clouds. At 4,500 feet, both aircraft topped out with Jesup in trail of the German. He took a long range shot at six hundred yards without observing any hits. *"At 400 yards I fired another burst and observed a cluster of strikes in the region of the cockpit. He slowly rolled off to the left and went down through a hole in the clouds in a spiral and went into the ground. I did not see the pilot get out."*

Following his aerial victory, Jesup went back above the clouds to try his luck again. There, he was mistakenly attacked by an RAF Typhoon. Having sustained no damage he descended back through the clouds and returned to Y-29.

The action over Asch was compact and fought at low altitude. No other air battle during the war was comparable. Many



Photo courtesy of Sam Sox, Jr.

William Whisner with his P-51 named after England's Princess Elizabeth. He was an Ace in WWII and also in the Korean War.

of the men later remarked that the action over Asch that day seemed almost staged—as if for a motion picture. Marion Nutter recalled in his letter home to his brother: *"I had always wanted to see a dogfight from the ground and I certainly got my wish. A movie couldn't have done better."*

The fighting over and around Y-29 that day also involved more than combatants. A Belgian woman who lived in Asch at the time recalled: *"We fled to the cellars because the bullets hit the walls of our house. In our street, a six-year-old girl was killed and two boys were badly wounded by the bullets. On the territory of Asch, three planes crashed. When everything was over, we went looking to the wrecks. We saw parts of bodies being gathered to put in bags. That made quite an impression on us."*

JG 11 was clear of Y-29 before 1000 that morning. The German attack did virtually no harm to the 352nd. Only one of the group's P-51s was hit. Cyrus Reap was the senior maintenance officer at Y-29 and recalled the damage: *"The straffing [sic] planes hit one of our parked -51s and ignited the fuel strainer in the wheel well. Our fire truck was trying to put out the fire by shooting foam into the air scoop, thinking it was the engine, but corrected this and extinguished the blaze."* For this niggling bit of damage the Luftwaffe paid a very dear price. During this unprecedented action, 11 of the 12 352nd pilots downed 24 German aircraft. The 366th's P-47 pilots were credited with an additional 8 aerial victories. Among the dead Germans was Günther Specht.

Not only were the non-flying personnel of the 352nd treated to the sight of their unit scoring an incredible victory literally in front of their eyes, but they were also exposed to the horror that was part of aerial combat. Richard DeBruin helped the graves registration team identify enemy pilots. *"We located remains on a field less than a mile from Y-29. The aircraft, an Me 109, was completely destroyed by fire and the pilot's torso was lying on the ground with the head and limbs severed and spread over the area. It was not something I cared to observe."*

What had been a banner day for the 352nd was stained by a singularly tragic event. DeBruin watched a formation of the group's Mustangs flying to the west of the airfield in the afternoon. *"This flight encountered some British Royal Air Force Typhoons. Suddenly one of our P-51s shot down a Typhoon, killing the British pilot."*

It was Francis Hill of the 352nd's 328th Fighter Squadron who shot down the Typhoon pilot, who was actually Flight Lieutenant Don Webber of Royal Canadian Air Force (RCAF) Squadron 183. Hill was devastated at his mistake. A squadron mate later talked to Hill: *"He said everybody was talking on the radio and hollering 'bandits.' He lined up on this one and gave a short burst; immediately he knew what he'd done and said he felt like jumping out."*



Wikipedia Commons photo via Sam Sox, Jr.

JG 11 Commander Günther Specht (left) with Dr. Kurt Tank, designer of the FW 190. Specht was among those lost on the attack of Y-29.

Bodenplatte suffered generally from the basic inability of the German flyers to execute the mission according to plan. The pilots were so inexperienced that many of them simply became lost on the way to their targets. Nevertheless, successes were scored. Although records are sketchy, the German attackers that morning destroyed approximately 350 Allied aircraft and damaged many more. But because almost all the aircraft the Germans destroyed were parked, the raid killed virtually no Allied airmen.

Ultimately, Bodenplatte did not achieve its objectives. Although the raid did cause some measure of panic, it had no appreciable effect on the ground campaign and the Allies recognized it for the desperate action it was. It cost the Luftwaffe approximately three hundred aircraft, but worse, it cost more than two hundred pilots killed and captured.

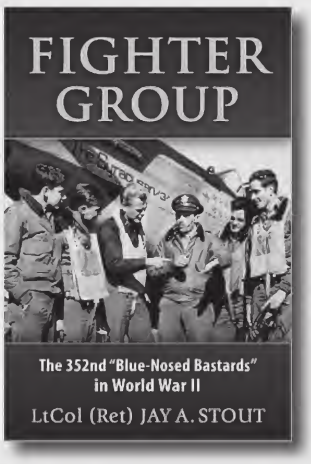
About the Author: This much-abridged article is extracted from Jay A. Stout's excellent book, Fighter Group: The 352nd "Blue-Nosed Bastards" in World War II *(Stackpole Books, 2012). It is provided courtesy of the author and publisher. Lieutenant Colonel Stout is a retired Marine Corps fighter pilot who flew 37 combat missions during DESERT STORM. A widely published aviation author, he currently works as a senior analyst for a leading defense corporation.*

FIGHTER GROUP

The 352nd "Blue-Nosed Bastards" In World War II
by LtCol (Ret.) Jay A. Stout

"Stout's aviation expertise sorts fact from fiction and drives to the bone and heart of the fighter pilot in World War II."
– Michael Franzak, author, "A Nightmare's Prayer"

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Hardcover, 430+ pages, 90 photographs, bibliography, index and end notes.



The X-15 Asteroids – An Adventure in Spaceflight and Astronomy

by Curtis Peebles

With completion of the STS-135 shuttle mission an era in spaceflight drew to a close. The shuttle program was the culmination of flight research programs that began with the X-1, which made the first supersonic flight. Like the X-1, high performance research aircraft that followed it, including the D-558-II Skyrocket, the second generation X-1 series, the X-2, and North American Aviation's X-15 were designed and built to collect data on the unknowns of flight at altitudes and speeds higher than any achieved before. But while the new speed and altitude records attracted public attention and engineers poured over the flight data, or that the records themselves were not the real point, the pilots of these later aircraft witnessed something wonderful.

As the research aircraft climbed higher the sky changed from simple blue to dark blue and finally to black; this was the color of space. Especially on the higher flights, when a pilot glanced out the window he saw the curve of the horizon. The Earth is a planet orbiting the sun; just one of the hundred billion stars in the Milky Way Galaxy, and the X-Plane pilots were the first to *see* the future. But to make that future a reality required many more steps.

The idea of spaceflight was inherent in the effort to build the high-speed/high-altitude research planes such as the X-15, even as it was the Mercury capsules that carried the first Americans into space. Consequently, the Mercury spaceflights overshadowed the X-15's flights, publicly anyway. Despite this, the advantages of a winged spacecraft were apparent to those with an eye on long-term space exploration and next generation vehicles. The X-15 could exceed 50 statute miles altitude, still considered to be the demarcation of space by the U.S. government, and its pilot became eligible to wear astronaut wings after such a flight. The pilot then guided the vehicle to a precise touchdown on Rogers Dry Lake at Edwards AFB, after which the X-15 would then be prepared for another flight. A total of 199 flights were made by the three X-15s. In contrast, each Mercury capsules made only a single spaceflight, and was (eventually) put on display in a museum. The X-15, it turned out, provided much of the experience and technology necessary to build the space shuttle.

Yet, with the passing of time, the contribution of the X-15's pilots, and of the vehicle itself have increasingly gone unrecognized. With the end of the shuttle program an opportunity presented itself to correct this: the X-15 pilots would finally receive the celestial accolades they so long deserved.

Between Mars and Jupiter is the asteroid belt. Within this region is the leftover material from the formation of our solar system. When an astronomer discovers an asteroid, or minor planet as they are often called, which had not been seen before, the next step is to observe the object for a sufficient time to calculate its orbit. If it is not identified as an already-known object, it is given a number. The discoverer then has the right for 10 years to propose a name for the new asteroid, or minor planet.

The rules for naming minor planets are relatively simple and include that the submission be:

- 16 characters or less in length (including any spaces or punctuation)
- non-offensive
- not too similar to an existing name of a minor planet or natural planetary satellite
- and to keep it professional, the granting agency discourages names of pet animals

If the discoverer does not suggest a name for the new celestial object within the 10 years he or she loses their naming privilege. Naming rights revert to the International Astronomical Union (IAU). At this point anyone can propose asteroid names to the IAU. In addition to the names, the nominator must submit a short citation justifying why the person or persons should be honored.

The IAU's Committee for Small-Body Nomenclature reviews the submissions, accepts or rejects the proposals, and picks the minor planets that will be given names. Instructions on writing the citations can be found at: *http://www.minorplanetcenter.net/iau/info/Astronometry.html#cit*

Thinking that this would be a fitting and permanent recognition in the heavens for the men who dared it all to fly the X-15, and with the assistance of Karl Bender, the librarian at the NASA Dryden Flight Research Center, I prepared citations for all twelve X-15 pilots, listing them in the order of each man's first flight. While we did not request it, we hoped the IAU would give the X-15 pilots a block of minor planets with sequential numbers. While the Committee for Small-Body Nomenclature was apparently pleased by the proposals, our submission ran into a problem: Neil Armstrong, the seventh pilot to fly the X-15, already had a minor planet named for him, [***(6469) Neilarmstrong***], in recognition of the Apollo 11 mission. As a result, the IAU declined to name another one for him. And so, in February 2012, the Committee agreed to name minor planets after the other 11 pilots, in the order of their first flights, and capping it off, provided the minor planets as a group.

Their citations read—literally:

(8022) Scottcrossfield – Test pilot Albert Scott Crossfield (1921-2006) was the first X-15 pilot and made a total of 14 flights. In 1953 Crossfield was the first pilot to exceed Mach 2 in the D-558-II Skyrocket. While a NACA research pilot, he made a total of 87 flights in the rocket-powered X-1 and D-558-II research aircraft.

(8023) Josephwalker – NASA research pilot Joseph Walker (1921-1966) was the second pilot to fly the X-15 and made a total of 25 flights. Three of these flights entered space and he received NASA astronaut wings posthumously in 2005.

(8024) Robertwhite – Air Force test pilot Robert M. White (1924-2010) was the third pilot to fly the X-15 and made a total of 16 flights. He was the first pilot to fly Mach 4, Mach 5 and Mach 6, and the first to fly a winged vehicle into space. White received Air Force astronaut wings for the flight.

(8025) Forrestpeterson – Navy test pilot Forrest Peterson (1922-1990) was the fourth pilot, and the only Navy pilot, to fly the X-15 and made a total of five flights.

(8026) Johnmckay – NASA research pilot John McKay (1922-1975) was the fifth pilot to fly the X-15 and made a total of 29 flights. Before joining the X-15 program, he made 46 flights in the X-1 and D-558-II Skyrocket. In 2005 McKay posthumously received NASA astronaut wings for a flight that reached an altitude of 89,900 meters.

(8027) Robertrushworth – Air Force test pilot Robert Rushworth (1924-1993) was the sixth pilot to fly the X-15 and made a total of 16 flights. One of these flights reached 86,800 meters, for which Rushworth received Air Force astronaut wings.

(8028) Joeengle – Air Force test pilot Joe Engle (b. 1932) was the eighth pilot to fly the X-15 and made a total of 16 flights in the X-15. He received Air Force astronaut wings for a flight that reached 85,500 meters. Engle also flew the Space Shuttle, becoming the only person who flew in space before being selected as a [NASA] astronaut.

(8029) Miltthompson – NASA research pilot Milt Thomson (1926-1993) was the ninth pilot to fly the X-15 and made a total of 14 flights. He subsequently made the first flights of the M2-F1 and M2-F2 lifting bodies, which were forerunners of the Space Shuttle.

(8030) Williamknight – Air Force test pilot William Knight (1929-2004) was the tenth pilot to fly the X-15 and made a total of 16 flights. These included the fastest X-15 flight, which reached Mach 6.7, and another flight to 69,600 meters for which he received astronaut wings.

(8031) Williamdana – NASA research pilot William Dana (b.1930) was the eleventh pilot to fly the X-15 and made a total of 16 flights. These included a 1967 flight to 93,500 meters and he received NASA astronaut wings in 2005. Dana made the 199th and final X-15 flight in 1968, and subsequently flew the M2-F3 and HL-10 lifting bodies.

(8032) Michaeladams – Air Force test pilot Michael Adams (1930-1967) was the twelfth pilot to fly the X-15 and made seven flights. On 1967 Nov. 15, he was killed when his X-15 broke up during reentry. The first American to die in the course of a spaceflight, Adams was posthumously awarded Air Force astronaut wings.

General Joe H. Engle was the first to receive his citation, when he came to NASA Dryden to speak on August 2, 2012. As Dryden Center Director David McBride presented Engle with his award, the three-time astronaut in the X-15 grinned and announced to the audience: *"This is my favorite planet."* William H. "Bill" Dana received his citation on September 14, 2012. Family members of other pilots will be receiving theirs in due course.

About the Author: Curtis Peebles graduated from Cal State Long Beach with a B.A. in History in 1985. He has specialized in aerospace history, his very first article on the X-15 is being published in Spaceflight *magazine. Since 2000, he has been a member of the NASA Dryden Flight Research Center's history office. He was at the Kennedy Space Center for the first Space Shuttle launch in 1981 and at Edwards AFB for its landing. We thank him for this unusual report and we look forward to a further display of his historical compositions.*

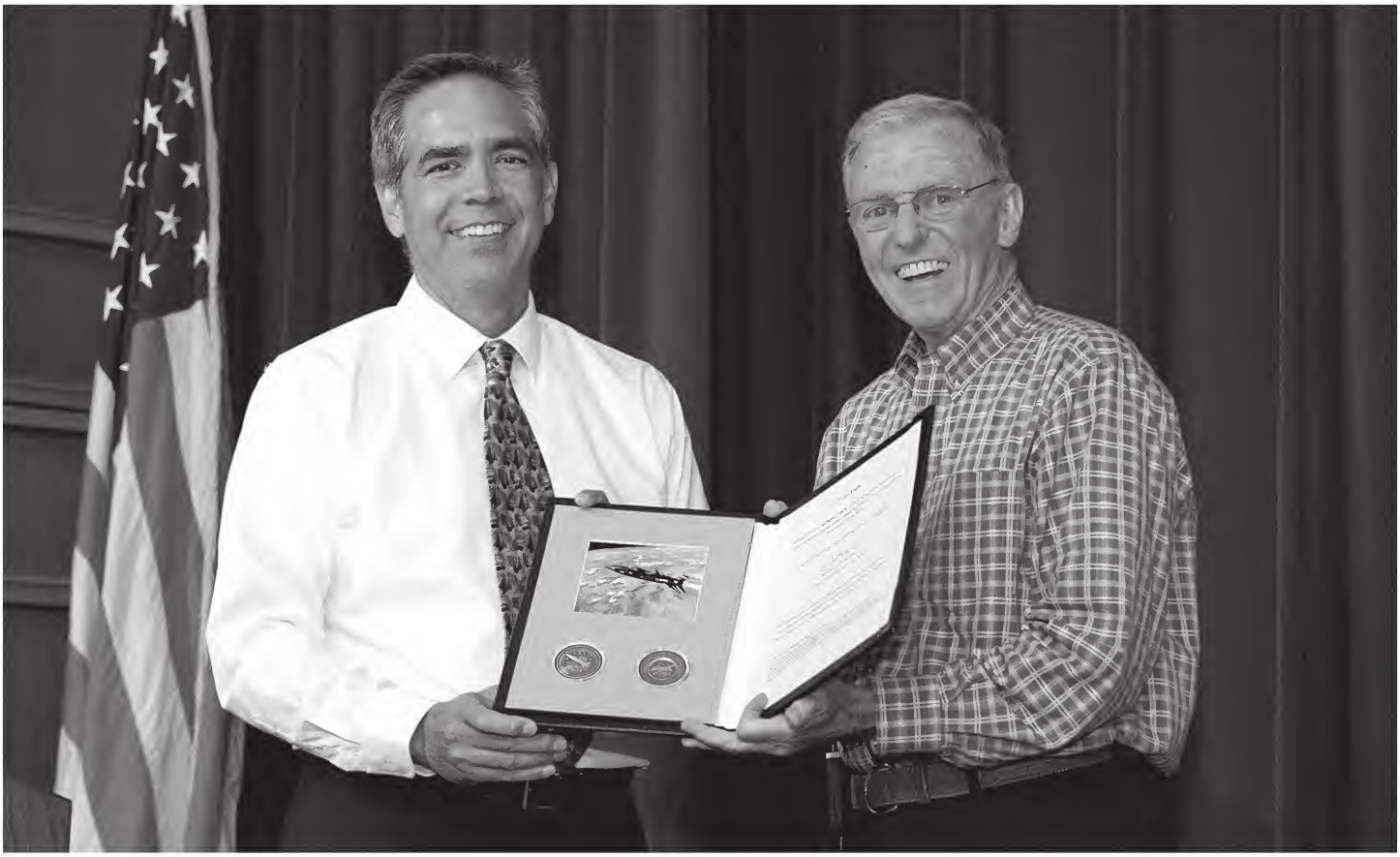


Photo courtesy of Dr. Christian Gelzer, NASA Dryden Flight Research Center

General Joe Engle (right) receives his citation from NASA Dryden Center Director David McBride, on August 2, 2012. In the citation are two limited edition commemorative X-15 coins—cast with a smidgen of an X-15 into each one—making them very special indeed.

North American Aviation Memorial Bench at Air Force Museum Ordered

by Ed Rusinek

In what can be only described as one of the shortest campaigns in the history of fund raising, your Retirees Bulletin has raised enough funds within four weeks to order the black granite North American Aviation Memorial bench for the National Museum of the United States Air Force. The granite contractor has already provided drawings of the engravings on the two sides which we have corrected and approved with a deposit check enclosed. The bench will be completed in five months. Having so many aircraft and space vehicles on exhibit at the museum park, it became impossible to list them all with the six NAA Divisions. Hence, we chose to list the Divisions on one side and all the Programs on the other. With the $500.00 set aside for the Air Force Museum Foundation for perpetual care, there are still sufficient funds available to examine the possibility of a similar memorial at the National Naval Aviation Museum in Pensacola, Florida. We have several Columbus retirees, familiar with that U.S. Navy institution, volunteer to pursue that possibility! Since the Bulletin asked for contributions for the bench at the Air Force Museum only, we do not want any contributor to feel that we have misrepresented this request by directing some funds to the Naval Museum. In fairness, any request for a refund will be, reluctantly but honestly, honored. The volunteer Staff of the Bulletin has never asked or received any remuneration for their service. However, it is a ground swell of enthusiastic support generated by you, our readers, that drives us to unfurl our colors and to charge into these projects with verve and élan!



List of Donors for NAA Memorial Ben

Name	City	Division Affilliation	Rememberance
Donald J. Safarik	Orange, CA	LAD	In Memory of My Fellow Marines in the Korean War
Juanita Cooke	Lakewood, CA	Seal Beach	
David Mercado	Anaheim, CA	Autonetics	
Peter F. Magoski	Buena Park, CA	S&ISD	In Loving Memory of My Wife, Ann Magoski
Doris L. Bybee	Anaheim, CA	S&ISD	
Rolf D. Schmued	Los Angeles, CA	LAD	In Loving Memory of My Father, Edgar Schmued, LAD
Marion L. Davis	Los Alamitos, CA	Seal Beach	
Richard S. Abele	Los Angeles, CA	LAD	
Thomas J. Maney	West Hills, CA	LAD	In Memory of My Friend, Bob Kalbach, LAD/S&ISD
Walter Christianson	Auburn, CA	Corporate	In Memory of Lee Atwood, Corporate
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Ann Dunbar	Riverside, CA	Autonetics	
Donald R. Sheffer	Santa Ana, CA	Autonetics	
Glenn Miller	Gahanna, OH	Columbus	
Betty & Steven Bilderback	Henderson, NV	S&ISD	In Memory of My Colleague, Ted Drotning, S&ISD
Ralph D. Guymon	Orange, CA	Autonetics	In Memory of My Friend, Don H. Pickrell, Jr., Marine Systems
Roger D. Song	Vancouver, WA	LAD	In Memory of Members of Flight Test at LAD, Palmdale and Edwards AFB
Alan J. Bockstahler	Woodland Hills, CA	LAD	
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Otto C. Juelich	Columbus, OH	Columbus	
John B. McMullen	Hamilton, MT	Autonetics	In Loving Memory of My Wife, Ruthie McMullen
Robert L. Schneider	Tustin, CA	Autonetics	In Loving Memory of My Father, Isadore Schneider, S&ISD
David L. Pankopf	Bullhead City, AZ	Seal Beach	In Memory of My Friend, Lee M. Smith, Seal Beach
Ken Fowler	Yucaipa, CA	LAD	
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J. Mack Parkhill	Dublin, OH	USAF	In Memory of My Friend, Paul McCormick, Columbus
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Larry W. Wilson	Placentia, CA	Autonetics	
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Ed Keary	San Marcos, CA	S&ISD	In Memory of My Friend, Gordon Jones, Seal Beach
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Henry H. Kong	Fullerton, CA	Autonetics	
Terrence J. O'Brien	Highmore, SD	S&ISD	
Kenneth J. Dyda	Rancho Palos Verdes CA	LAD	In Memory of the LAD Flight Simulation Lab Members
Gary L. Phelps	Prescott, AZ	Seal Beach	
Donald L. Stevenson	Palmdale, CA	Rocketdyne	
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William & Lilah Santo	Westerville, OH	Columbus	
Marion E. Fisher	Eagle, ID	Autonetics	
Donna M. Bright	Lancaster, CA	Wife	In Loving Memory of My Husband, Bill Bright, LAD
Thomas H. Ellis	Palmdale, CA	LAD	

ch at USAF Museum in Order Received

Name	City	Division Affilliation	Rememberance
Larry E. Olson	Long Beach, CA	S&ISD	In Beloved Memory of Lilly Lee, S&ISD
David C. Swann	Santa Maria, CA	S&ISD	In Memory of My Friend, David Llorente, S&ISD
Stephen A. Evans	Foothill Ranch, CA	Rocketdyne	
Edward P. Smith	Pismo Beach, CA	S&ISD	
William Littleton	Woodland Hills, CA	Atomics Intl.	
Mike A. Lopez	La Mirada, CA	Corporate	In Memory of Bob Johnson, Corporate
William M. Darling	Rancho Palos Verdes CA	Corporate	In Memory of Joe Beerer, Corporate
Cecil M. Scott	Sun City, CA	Autonetics	In Memory of My Fellow P-51 Pilots of the 67th Tactical Reconnaissance Group in the ETO
Roger & Joyellen Wood	Powell, OH	Corporate	
Basil Mikhalkin	Valley Center, CA	S&ISD	
John R. Andres	Seymour, TN	Columbus	In Memory of My Friend and Mentor, Rudy Medina, Columbus
Douglas J. Lowen	Cocoa Beach, FL	S&ISD	In Memory of My Friend, Walter J. Antoniewski, S&ISD
Ben Boykin	Las Cruces, NM	S&ISD	In Memory of My Friend, Francis "Frank" Snook, S&ISD
Donald R. Binns	Boulder, CO	S&ISD	In Memory of My Friend, Bunky Aldred, Rocketdyne/S&ISD
Nelson Wong	Irvine, CA	LAD	In Memory of NAA Founder, James "Dutch" Kindelberger
Leesa L. Ross	Austin, TX	Daughter	With My Love for My Father, Nolan Leatherman, Columbus
Joseph F. Simms	Blacklick, OH	Columbus	
Kenneth A. Jungeberg	Liberty Twp, OH	Columbus	
George G. Brennan	Hawthorne, CA	LAD	
Allan P. Jacoby	Oceanside, CA	LAD	
C. S. "Chuck" Suffecool	Laguna Niguel, CA	Autonetics	
Carole L. Smith	Westminster, CA	Autonetics	
John R. Boone	Big Bear City, CA	LAD, Autonetics	
John W. Paul, Jr.	Escondido, CA	LAD	In Memory of My Friends George Mellinger, Roy Ferren, Willie Schoch, LAD Flight Test
John J. Laughlin	Seal Beach, CA	S&ISD	In Loving Memory of My Wife, Elsie Laughlin, S&ISD
Gerald W. Miller	Los Alamitos, CA	Autonetics	
John L. Young	Canal Winchester, OH	Columbus	
Sonnie K. Robertson	Canyon Lake, CA	Autonetics	In Loving Memory of My Friend, Judy Weaver, Canyon Lake
Nolan H. Leatherman	Reynoldsburg, OH	Columbus	In Memory of George R. Gehrkens, Robert C. Brown, Dana T. Caldwell, Columbus
Jeanne Campbell & Mary Elaine Wilson	Huntington Beach, CA	S&ISD	With Thanks to a Great Boss, Charles "Chuck" Lowry, S&ISD
Lana Van Aggelen	Hermosa Beach, CA	LAD	In Memory of My Friend, Walter Morris, LAD
Francis L. Underwood	Beavercreek, OH	LAD	In Memory of My Friend, George E. Fitch, LAD
George Whited	Columbus, OH	Columbus	In Memory of Engineering Director Ed Culp, Columbus
Cesar F. De Barro	San Juan Capistrano, CA	S&ISD	
Jack E. Shuter	Worthington, OH	Columbus	
John A. Shannon	Columbus, OH	Columbus	
Richard L. Lovitt	Fullerton, CA	Space	
Sonnie Robertson & Lou Tiberio	Canyon Lake, CA	Autonetics, S&ISD	In Loving Memory of My Mother, Lucille Flowers, S&ISD
Daniel L. Strominger	Columbus, OH	Columbus	
Robert E. Kester	Columbus, OH	Columbus	
Jacob Adelstone	Lake Balboa, CA	S&ISD	In Memory of My Director, Scott Crossfield , S&ISD
Ray & Stafani Operacz	Redondo Beach	LAD	In Memory of Our Parents, Dick & Patty Hiatt, Corporate
Peter A. Price	Los Alamitos, CA	USAF	
Bettye H. Etzel	Hays, KS	S&ISD	In Loving Memory of My Husband, Charles W. Etzel and His Mother, Edna Etzel, LAD
Edmund J. Rusinek	Rossmoor, CA	S&ISD	In Memory of NAA Test Pilots Al Blackburn, Jim Pearce, John Moore, Scott Crossfield, James Roberts, Al White, and George "Wheaties" Welch
	Total Donated to Date	$8,525.00	

NAA Atomics International Division Creates Neutron Ray
(State Department Denies Application for Preventing Terrorist Attacks)

by Cleve Kimmel

(Extracted in part from an article in NAA Skyline, 1969, Volume 27, Number 2; and from a personal tour of the Condec Corporate Subsidiaries in the 1980s offered to me, so that I could better understand their product lines and manufacturing capabilities.)

Strange as it may seem, there appears to be no current 'direct' connection or reference to this valiant effort – nor the Atomics International application advancements created by Condec Corporation. This advancement was for the safeguard of American personnel throughout the world. Virtually all current references and uses of N-ray are linked to medical research! The Shield Test and Irradiation Reactor (STIR) development tests were held in high secrecy at that time; and advertised applications were 'apparently' limited to medical research and product testing. What I am presenting is an overlooked application of the neutron particle emitter. A modified emitter design, created by one of the numerous Condec Corporation Divisions prior to the 1980s was designed to detect terrorist threats world-wide.

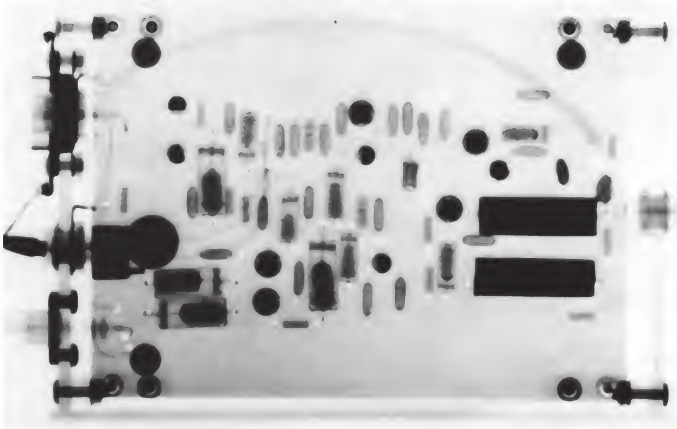
Located in the Santa Susana Hills of Southern California was the NAA "AI Division" that designed, manufactured and tested large rocket motors. Buried deep within a hillside was an underground concrete bunker that housed the Atomic Energy Commission's Shield Test and Irradiation Reactor. Through the use and testing of STIR, the AI researchers using that device developed a process that in the 1960s became known as "neutron radiograph" or N-ray for short. It is considered a cousin of sorts to the X-ray. Dr. Gunter Gigas, Program Manager at AI in 1969, described the device's features as: *"…one difference is that an X-ray can show up dense materials such as iron pipe or human bone. Thermal neutrons, or N-rays, as we sometimes call them, ignore most of these and instead show up such things as hydrogenous materials. Cracks, etc., can be readily detected in such things as circuit boards."*

Original testing was performed on various objects – ranging in size from a few millimeters to over 100 sq ft; with such items as: cigarette lighters, motorcycles, toasters, padlocks, guns, and oil cans for example. The objects were mounted vertically in front of normal black & white film negative and then exposed to a very short burst of N-rays from the reactor's thermal discharge lens, at a distance of about 10 to 20 feet. The film was not directly exposed, and it wasn't as sensitive to neutrons as it was to X-ray (gamma ray) or beta ray discharges. A metallic, neutron sensitive converter was mounted between the object and the film to capture the neutrons, which in turn, released beta and gamma rays that exposed the film. NAA researchers discovered that radiograph negatives could discern precisely the explosive level in bullets, and then reasoned that if a bullet 'could be undressed', the same thorough examination could be given to a variety of Apollo/Saturn V explosive devices without relying on a test based on hope. *(One or more devices from a lot would be randomly tested. If these performed acceptably, then it could be assumed that the others would do the same when actually called upon to function!)* Images of the Apollo Coupler and the Reefing Line Cutter (Ken Golliher pictured) can determine any defects in the powder charges, as shown below, without the hope test:



Cleve Kimmel Photo

Apollo Explosive Coupler, X-ray View (left) vs. N-ray View (right)



Cleve Kimmel Photo

N-ray View of a Circuit Board



Cleve Kimmel Photo

Ken Golliher holds an Apollo Reefing Line Cutter.

"The process will actually work with anything that brings out hydrogenous or neutron absorbent materials", stated Oscar Hillig, reactor supervisor. Boron fiber composites, titanium welds, nuclear fuel plates, radioactive components, organic waste like wax deposits in lines, and detection of early stages of cancer growth in humans were considered for applications.

X-rays involve atomic phenomena, but thermal neutrons (N-rays) are the result of true nuclear events of absorption and scattering. Neutrons have two main types of reaction with the atomic nuclei: absorption (capture), and scattering. Thus, the absorption for these thermal neutrons is a function of both the scattering and capture probabilities for each individual element. The material density or thickness being examined has little relative value, whether it is opaque or transparent to the passage of neutron particles. By carefully mapping these functions to each element, a database of characteristics can be used to separate dangerous elements from safe ones.

Condec Corporation Carried the NAA-AI Development One-Step Further and Created a "Security Scanner for Detection of Explosives"

A variation of the NAA-AI process was soon adopted by one of Condec Corporation's East Coast divisions (part of the Consolidated Controls Corporation) soon after this discovery was released to the world. It was here, in the early 1980s that I was privileged to tour the facility and speak with the plant manager about their various product lines, which included this security scanner. They created a simpler version of the N-ray discharge that didn't require a reactor, and coupled it with an extremely fast computer system for identification and concentration of all known elements. They applied this process for the virtually immediate detection of explosive material (explosive elemental combinations or completed bombs) of any known type that might be used in a terrorist threat to our nation's businesses, libraries, hospitals, parking lots, embassies, and the like. The use of film was replaced by a feedback system that flowed neutron particles from one concealed 'pole like' device to another over a wide distance, such as a road, or between buildings. The computer had a huge memory map of all known compounds that could be used as a potential for an explosive device. It measured the variances in time and energy releases between the two poles as related to specific elements; and variances in concentration and scattering provided a distinct footprint of the chemical composition and the amount associated with it. Consider for example the corporation's primary design that was undergoing test: "a truck driving at 20 mph passing through the beam, and carrying explosive compound elements, or completed explosive charges, concealed within the engine crankcase, in the tires, on the driver, etc, or lead shielded, could be identified and detected before the truck had traveled 20 feet".

There appeared to be no serious national interest or need to provide such exacting terrorist protection to U.S. embassies, personnel, or governmental offices throughout the world, as all appeared calm to our government after elimination of the "Cold War" threat. Unable to get further financial aid grants or a contract with the State Department, the divisional efforts and technologies were then forced to be scrapped in the 1980s. This division was soon disbanded along with their technical engineering geniuses and equipment. I often wonder how many lives, family heartaches and dollars could have been saved; had the U.S. Government allowed this process to be implemented? The estimated cost per site installation was pegged at $1 Million. The deterrent methods for stopping intruders used at the Oak Ridge, TN nuclear facilities could have been easily installed as part of terrorist suppression. Since it was designed for detection of chemical compounds; it appeared that dangerous airborne and viral compounds could have been added.

About the Author: Our readers are totally aware of the fantastic capabilities Cleve Kimmel possesses to explain complex matters in words we can all understand. When combined with the fact that these events transpired 50 years ago, it is truly amazing!

"There are 10^{11} stars in the galaxy. That used to be a huge number. But it's only a hundred billion. It's less than the national deficit! We used to call them astronomical numbers. Now we should call them economical numbers."

— Richard Feynman



Photo courtesy of the Boeing History Archives Office

A panoramic sweep of the flight line as workers gather to welcome Lt. Col. Jimmy Doolittle after his return from the Tokyo Raid with B-25 Mitchell bombers serving as a backdrop.



Photo courtesy of the Boeing History Archives Office

A delighted "Dutch" Kindelberger escorts Jimmy Doolittle to the "Welcome" stand on the flight line.

Congratulations and Best Wishes to

Dan and Maxine Hays of Folsom, California
celebrating their 72nd Wedding Anniversary

William and Patricia Darling of Rancho Palos Verdes, California
celebrating their 70th Wedding Anniversary

James and Arline Hollen of Thousand Palms, California
celebrating their 70th Wedding Anniversary

Howard and Estelle Wilkerson of Sedona, Arizona
celebrating their 70th Wedding Anniversary

John and Ellen Paul, Jr. of Escondido, California
celebrating their 69th Wedding Anniversary

William and Betty Anderson of Seattle, Washington
celebrating their 68th Wedding Anniversary

Donald and Rose Pehrson of Rolling Hills Estates, California
celebrating their 66th Wedding Anniversary

Arthur and Donna Franson of Lake Elsinore, California
celebrating their 65th Wedding Anniversary

David and Patricia Ann Swann of Santa Maria, California
celebrating their 61st Wedding Anniversary

Kenneth and Lorraine Dyda of Rancho Palos Verdes, California
celebrating their 60th Wedding Anniversary

Leonard and Teddie Jean Replogle of Placentia, California
celebrating their 60th Wedding Anniversary

John and Vivian Andres of Seymour, Tennessee
celebrating their 59th Wedding Anniversary

William and Nadine Giacone, Jr. of Murrieta, California
celebrating their 59th Wedding Anniversary

Arthur and Shirley Corriveau of The Lakes, Florida
celebrating their 56th Wedding Anniversary

Robert and Bessie Wilmoth of Overland Park, Kansas
celebrating their 55th Wedding Anniversary

Emery and Julia Gajdos of Bermuda Dunes, California
celebrating their 45th Wedding Anniversary

John and Jo Tranchina of Mesa, Arizona
celebrating their 45th Wedding Anniversary

John W. Sandford of La Jolla, California
on being inducted into Canada's Aviation Hall of Fame

Contrails From The Past

by Ed Rusinek

Dear Ed,

Thank you for the splendid Winter 2012 Issue—one of the best! I am very happy to contribute for our NAA bench at the USAF museum at Wright-Patt. Some of NAA's work may not be mentioned—but whenever there are plane buffs—our planes are the topic!

— Doris Bybee. Anaheim, CA

Ed's Ans.: Thank you for your contribution and for your understanding. We recognized all the efforts that have been dedicated to the USAF beyond the airplanes and our Nolan Leatherman has been meeting with museum staff to include these in the list of accomplishments.

Dear Ed,

Enclosed is a copy of the Warbirds Over Monroe 2012 Air Show Program from the air show I recently attended in Monroe, North Carolina. It was a great show with a huge audience in attendance. It was wonderful to see the NAA airplanes perform. It made me proud to have been a member of the NAA team!

I was secretary to George Mellinger, Manager of Engineering Flight Test, for five years. Then I completed my career at Corporate Office as an administrative assistant to Bernie Haber, Vice President of Research & Engineering, and later, to Dr. Michael Yarymovych, for a total of 28 years.

— Mary Leone, Fort Mill, SC

Ed's Ans.: How thoughtful of you to send me the air show program. You ladies, whether you were installing cables in airplanes out in the shop or typing reports in the offices, formed a vital bulwark of the company. Often, you were not fully appreciated but you took pride in your efforts and did your best! Thank you for your service.

Dear Ed,

Thank you so very much for the Bulletin. I do enjoy reading about the many fabulous accomplishments of NAA. I started working for Western Electric in Kearny, New Jersey when I was 18 years of age. When I moved to California in 1952, I really wanted to work for NAA. Behold! They hired me. I started working at the new Autonetics Division located in a triple length Quonset hut on Trigg Street in Los Angeles. I worked as an assembler and loved every minute of it!

I cherish the 20 years that I spent at Autonetics and I am most thankful for the wonderful opportunities offered during those years. When I retired in 1973, I bought a trailer park in Desert Center, California. I am still running this place. It keeps me very busy.

— Mary Zeiler, Desert Center, CA

Ed's Ans.: Too bad that NAA isn't around any longer, Mary. You would have made a great spokesperson for the Company. If I ever pass through Desert Center, I shall stop and say Hello!

Dear Ed,

The article in the Winter 2012 Issue about the Apollo 12 Mission brought to mind a conversation I had with Command Module Pilot Richard Gordon. I asked him whether the Apollo 12 Mission gave him his greatest anxiety. He replied, *"No. As a Naval Pilot, landing on a carrier in rough seas at night did"*.

— William Hotarek, Ellensburg, WA

Ed's Ans.: Whether landing on a swaying carrier at night or remaining calm when the electrical system in your spaceship is going through gyrations which may keep you from returning to Earth requires the finest of our Nation and we had them!



Photo courtesy of Mary Leone

NAA Retiree Mary Leone attended the Warbirds Over Monroe 2012 Air Show in Monroe, North Carolina in November.

Dear Ed,

The memorial bench speaks to North American Aviation's remarkable history and many of aviation's firsts. I would encourage every NAA member to step up to the bar and make this project a reality! Accordingly, I am enclosing my contribution. Thanks for making the Bulletin what it is, Fantastic!

— Pete Magoski, Buena Park, CA

Ed's Ans.: Thank you for the very generous check. But, thank you more for being my friend! I have very few friends left and you are always a breath of fresh air!

Dear Ed,

Enclosed is my check for the NAA Memorial Bench at the USAF Museum. The Retirees Bulletin and this "Bench" would not have happened without your perseverance and leadership to "Make it Happen!" Thanks.

— Ben Boykin, Las Cruces, NM

Ed's Ans.: Thank you for the donation and the kind words. Perseverance and leadership will take you only so far. It is the five volunteers that have stuck together 13 years and the more than 150 artists, writers, engineers, historians, pilots, USAF officers and "good hearts" that have stepped up and helped us eagerly and graciously that have made it possible for the Bulletin to exist! Since you provided us several articles, you count among them!

Dear Ed,

Since Nolan Leatherman has carried the request for a "Memorial Bench" to the goal line, Steven and I would like to help score the goal! Enclosed is our check.

— Steven and Betty Bilderback, Henderson, NV

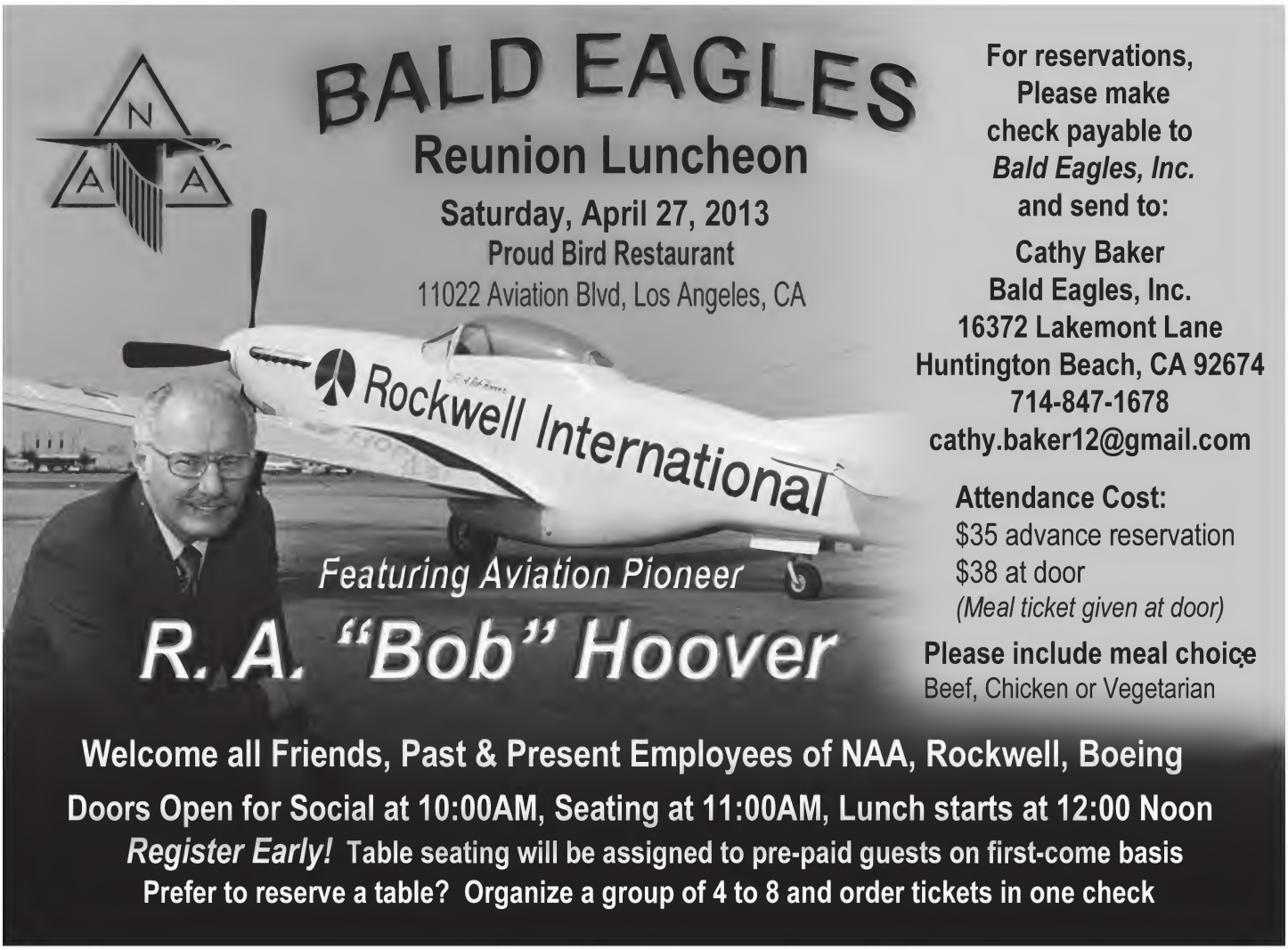
Ed's Ans.: Betty, you always were a great team player when we worked in the Problem Action Center in Downey and I expected nothing less in this effort.

Dear Ed,

Enclosed is my check as pledged to support the NAA Memorial Bench at the National Museum of the USAF. I am very proud to have been a part of a company with such a rich heritage. I joined NAA, Aircraft Division in November 1956. I was drafted and served two years in the Army then rejoined NAA for a total of 38 years. I was assigned to the Engineering Planning Department and worked with many of our most talented people. It was a privilege. I feel honored to be able to support this Memorial to North American Aviation. Thank You.

— Nelson Wong, Irvine, CA

Ed's Ans.: Your contribution for the Bench was magnificent and that you dedicated it to "Dutch" was a noble and dignified gesture!



The Silent Majority

by Stan Guzy

ANTONIEWSKI, WALTER J., 74 – a resident of Viera, FL, Walter passed away on January 24, 2013. After serving in the USAF Atlas Missile Program, Walt joined the NAA S&ISD program at KSC in 1965 on the Apollo Program. Assigned to the Environmental Control Systems, he developed such detailed expertise that on subsequent programs, he became known as Mr. ECL. After retirement, he returned and served as a consultant to the very end of the Shuttle Program. A dedicated individual, he served as a high school football referee for Brevard County, a Rockledge Little League coach and a long time member of St. Mary's Catholic Church in Rockledge. He is survived by his loving wife of 50 years, Patricia. Walt was truly a gentle man.

BAILEY, WILLIAM, 79 – passed away on January 20, 2013 in Yorba Linda, CA. With an M.S. in Electrical Engineering, Bill served at NAA/RI for 35 years before retiring in 1995. He is survived by his wife of 55 years, Ann.

BARBUSCIA, ALBERT A., 74 – of Palmdale, CA, passed away on November 7, 2012 with his family at his bedside, after a long struggle with ALS. Al served in Quality management when he retired. He is survived by his wife of 50 years, Rae.

CLARK, PAUL W., 88 – of Mission Viejo, CA, passed away on December 22, 2012. Paul joined Autonetics in 1959 and retired in 1990 with 20 years of intermittent service. He is survived by his wife of 59 years, Marjorie

COMER, F. "DON", 83 – of Downey, CA, succumbed on November 15, 2012. He came in 1974 and served at Seal Beach as Advanced Program Manager on various satellite and space programs before retiring in 1993 to enjoy his avocation of advanced woodturning. He is survived by Jackie, his loving wife of 60 years.

DIRNER, ALBERT E., 76 – of Laguna Niguel, CA, passed away at home on January 20, 2013. Al served at NAA/RI for over 40 years. He is survived by his wife, Ann.

DOUCETTE FRANK E., 84 – passed away in Wildomar, CA on December 22, 2012. Frank joined NAA shortly after being discharged from the U.S. Navy in 1947. He retired from Space Division in 1999 with 43 years of service. He and his wife, Donna, moved to Lake Elsinore after retirement. She passed away in 1994.

DUVALL, JERRY, 68 – succumbed on April 7, 2012 from a COPD lung condition. He joined LAD in Tooling and was transferred to Palmdale as a supervisor in Assembly Tooling. He retired in 1982 with 30 years of service and moved to Theodosia, MO with his second wife, Jane, who nursed him through his long illness.

ELLIOT, DOUGLAS "DOUG" Ph.D., 80 – of Bainbridge Island, WA died of a brain tumor on July 18, 2012. He was a mathematician, physicist and electrical engineer. Doug coauthored two popular engineering reference books on digital signal processing. He served 38 years at Autonetics. He is survived by his wife, Carol.

FAULDERS, CHARLES R. "CHUCK", Ph.D., 85 – of Camarillo, CA, passed away after a long illness on July 21, 2012. A brilliant mind, he completed his M.S., M.E. and Sc.D. degrees at M.I.T. while working on steam turbine designs for G.E. He began his 36 year career with NAA at S&ISD in 1954 on the Navaho program. In 1960, he took a leave of absence to serve as Professeur Asssocie at the Universite d'Aix-en-Provence, teaching Astro-Physics in French. Chuck returned to NAA in 1962 and joined the newly formed Flight Science Lab to investigate the possibilities of aerospace vehicles. In 1976, he transferred to Atomics International where he worked on coal gasification and energy systems. His last project before he retired in 1990 entailed geothermal studies of the Imperial Valley. Chuck was modest in his accomplishments, deep in his faith in God, dedicated to his family and friends. He is survived by his loving wife of 58 years, Rita.

FREY, GEORGE C., 91 – passed away on January 1, 2013 in Manhattan Beach, CA. Graduating from Cal Tech with a B.S. Degree in June 1943, George accepted a position with LAD. It was a time when wings of airplanes were still covered with cloth. He dedicated 67 years as a Materials and Processes Engineer on the P-51, B-25, X-15, XB-70, F-86, F-100, FJ-1, Apollo, GPS, and Space Shuttle where he developed numerous advanced material concepts for these programs. He is survived by his loving wife, Madeline.

HAMMOND, GERALDINE E. "JERRY", 81 – of Covina, CA, passed away on August 5, 2012. Jerry was in charge of QC Stamp Control at all Space Division sites during the Apollo-Saturn programs of the 1960s. She is survived by her loving husband of 40 years and also a retiree, Bob.

HANSEN, VICTOR E. – of Rancho Palos Verdes, CA. Bulletin returned stamped "Deceased". Victor retired from Autonetics in 1984 with 38 years of service.

HENRY, BOB – of Prescott, AZ. Bulletin returned stamped "Deceased". Bob retired from Space Division in 1989 with 25 years of service.

HERGESELL, RUSSELL E., 88 – of Upper Arlington, OH passed away on November 17, 2012. After serving in the Army, including the Battle of the Bulge, Russell received a B.S. degree in Accounting from Ohio State University. He retired from North American Rockwell Columbus Division.

JOHNSON, GORDON W., 83 – of Yorba Linda, CA passed away on January18, 2013. Gordon came to the Environmental Control Systems Heat and Vent Group at LAD in 1952. He retired in 1999 with 48 years of service. Gordon was a likeable colleague with a fine work ethic. We were advised of his passing by his daughter, Peggy.

HOSKINSON, DANIEL L., 92 – passed away on April 29, 2012. He served for many years in the Autonetics Fire Control Group. Information of his passing was provided by his son, Larry.

KADERA, JOE, 85 – passed away on December 23, 2012 at home in Rancho Palos Verdes, CA surrounded by his family. Joe retired in 1990 with 40 years of service at LAD as an engineer on the F-86, F-100, B-1 and Space Shuttle. He is survived by his loving wife Christel.

LIVERS, LAWRENCE E. "LARRY", 95 – passed away on January 12, 2013 in Carlsbad, CA. Larry began his career at LAD where he was also President of the NAA Management Club. He later transferred to Space Division from where he retired in 1977 with 40 years of service. He is survived by his loving wife of 71 years, Betty.

MOON, FRANK K., 89 – died on January 14, 2012 as a result of respiratory failure due to post-surgery pneumonia developing after surgical repair of his hip. Frank retired from LAD in 1981 after 30 years of service. We were advised of his passing by his son, Darrel.

NELSON, DEAN, 83 – of Nipomo, CA, passed away on November 14, 2012, Dean served as an engineer at Space Division and retired from Rockwell at Vandenberg AFB in 1988 with 28 years of service. Dean was a kind and gentle man with a warm smile.

PETRAS, GEORGE, 85 – of Anaheim, CA, passed away on January 29, 2013. Trained at Penn Technical Institute in electronics, George worked on flight simulators at Forbes AFB in Topeka, Kansas before coming to Space Division as an electrical engineer. He helped publish the Apollo Mission Simulator Operator manual and similar documents for the Minuteman Missile System, the F-111D and the B-1. George was surrounded by a close family and friends. He is sorely missed.

ROGERS, CHARLES, 79 – passed away on November 29, 2012 surrounded by his family at his home in Yorba Linda, CA. Charlie joined NAA and served for 30 years when he retired in 1990. He is survived by his wife of 58 years, Kay.

SCOTT, CECIL "CY", 91 – died gently at home in Sun City, CA on February 13, 2013. During WWII, Cy flew a P-51 with the 67th Tactical Reconnaisance Group. He began with NAA in Columbus in 1952, followed by a stint in Fresno, in Chatsworth, at McGregor, in El Segundo and at Anaheim, where he served as Director of Labor Relations. He lost his loving wife, Ann, in 1997.

SMITH, THOMAS J. "TOM", 80 – of Yucca Valley, CA passed away on December 27, 2012. Tom started on the Space Program at Autonetics in 1961 and, subsequently, transferred to the Space Division. He was a Manufacturing manager on the Space Shuttle and retired in 1987. An avid golfer, he and his loving wife, Rena Beth, moved to Yucca Valley, CA where he participated in many tournaments.

SCHWARTZ, WILLIAM P., 84 – died on December 22, 2012 of complications from diabetes and Alzheimer's disease. He came to Autonetics on the Minuteman project in 1968. He later became Corporate Director of Operations at KSC. Bill was predeceased by his first wife, Patricia, and is survived by his second wife, Jean.

SNOOK, FRANCIS F. "FRANK", 93 – of Scottsdale, AZ, passed away on December 20, 2012. Joining the U.S. Navy in 1937, Frank honed his skills and became a radioman. Discharged in 1940, he joined the Foreign Service of the U.S. State Department as a radio operator. With United Airlines during WWII, he flew with Air Transport Command. Joining LAD, he became a Field Tech Rep on the F-86 Series in Korea. Transferring to Downey, he was assigned to Requirements and Planning supporting the Hound Dog program. On the Apollo program, he transferred to NASA Houston to support the Thermal Vacuum test series. He retired from the NASA facility in 1980 and moved to Scottsdale, AZ. He is survived by his wife, Arlene.

STODGEL, THOMAS O., 93 – died on December 12, 2012 in Fullerton, CA. Tom came to North American Aviation in the 1950s with an accounting/business background. His career spanned 27 years, ending in retirement as Chief Financial Controlling Officer at Autonetics. His wife, Pat, passed away in 1967. Tom was a generous and kind man, dearly loved by his family.

WILSON, ARTHUR J., 94 – of White River Junction, VT, passed away in August 2012. Art retired from Space Division in 1976 with 25 years of service. Bulletin was notified of his passing by his son, James.

WILSON, JACK, 74 – died on January 19, 2013 in Orange, CA after a valiant struggle with heart and blood issues. Jack came to Autonetics in 1961 and became a "passive devices" expert in Component Engineering. He was also very active in the Recreation Center golfing activities. Jack retired in 2005 with 43 years of service.

LOST SHEEP, BULLETIN RETURNED WITH NO FORWARDING ADDRESS

EDMUND CODY – WALNUT CREEK, CA

LES HALL – ENCINO, CA

KENNETH G. JONES – AJO, AZ

DONALD A. MARTIN – COSTA MESA, CA

JOSEPH G. MOORE – MANHATTAN BEACH, CA



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North American Aviation Retirees Bulletin
"Where The Best Never Rest"

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Photo Courtesy of the Boeing History Archives Office

Upon his return to North American Aviation after the Tokyo Raid, Lt. Col. Jimmy Doolittle was greeted by the men and women of NAA, builders of the planes he flew off the aircraft carrier* USS Hornet. *In selecting the plane to accomplish the task, he had to find one that could take off within 500 ft, from a space 75 ft wide and carry 2,000 lbs of bombs 2,000 miles. His choices were the Douglas B-18 or B-23, the Martin B-26 or the NAA B-25. The B-18 could not carry enough fuel or bombs, the B-23 wingspan was too great, and the B-26 needed too much takeoff distance. However, with some simple modifications, the NAA B-25 could perform this extremely difficult and untried mission!

NORTH AMERICAN AVIATION
Retirees Bulletin
"Where The Best Never Rest"

Summer 2013

2013 North American Aviation Outstanding Cadet Recognition Awards



Cadet First Class Evan Rishel
Outstanding Achievement
Aerodynamics



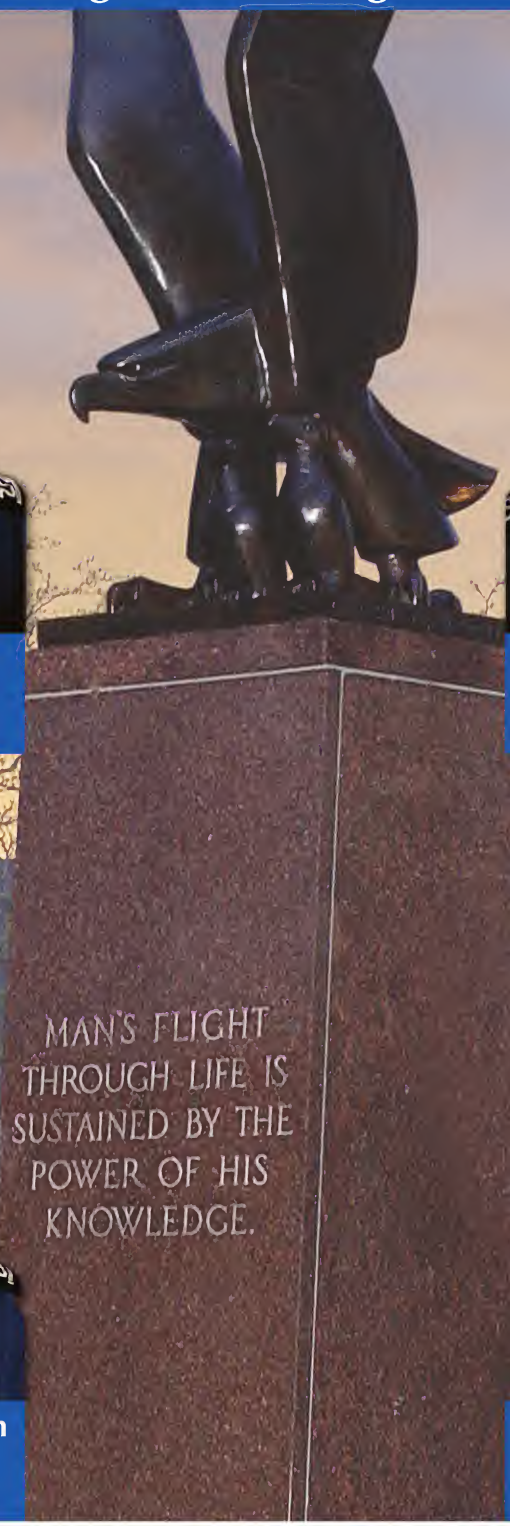
Cadet First Class Zachary Adams
Excellence in Basic Research
in Aerodynamics



Cadet First Class Andrew Hilton
Outstanding Achievement
Astronautics



Cadet Candidate Juan Orozco
Outstanding Cadet
USAFA Preparatory School



NORTH AMERICAN AVIATION
Retirees Bulletin

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The NAA Retirees Bulletin can be contacted at The Boeing Company, Seal Beach facility by phone at (562) 797-3836. Send mail to:

North American Aviation Retirees Bulletin
P. O. Box 3797
Seal Beach, CA 90740

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Dear NAA Retirees Bulletin Subscriber

This has been one "lollapalooza" of a quarter in which we have ordered the black granite memorial bench for the USAF museum in Dayton, Ohio and opened negotiations for a duplicate bench at the Naval Air Museum in Pensacola, Florida, asked Hugo Fruehauf to be the NAA speaker at the USAF Academy and the AIAA Chapter in Colorado Springs, Colorado and had Lt. Col. John Swanson, U.S. Army Reserve and our Pete Magoski present the NAA 2013 Outstanding Achievement Awards to one graduate cadet candidate at the USAF Academy Prep School and three graduating seniors from the USAF Academy. We also welcomed three new authors to the Bulletin. Finally, we participated in the yearly Bald Eagles Luncheon with Bob Hoover as the speaker.

We have crossed the $10,000 mark in donations for the two benches for the USAF Museum and U.S. Naval Air Museum. We estimate that another $1,000 should cover all expenses for the two projects. Both granite benches will be identical, made by the same stone mason shop in Ohio, except for the list of NAA aircraft, missiles and guidance and control systems delivered to that Service.

In this issue, we once again welcome an astronaut we worked with in Downey for many months after the Apollo 1 fire on the pad at KSC. He helped prove that the Apollo Command and Service Modules were safe and ready to take three Americans to the Moon! It is Apollo 7 Astronaut Walt Cunningham. He recently wrote an opinion piece on what path NASA should follow in the future. We asked him for permission to reprint the article and he very graciously gave it.

Although, he did not achieve fame in the Navy flying NAA aircraft, he is an extraordinary person and a great combat pilot. Joining the Navy in 1939 as an ordinary seaman, he demonstrated many skills that led to promotion until he was finally sent to flight school and received his golden wings. Joining the fleet in the Pacific late in the war, he flew cover over Okinawa and scored five victories against the Kamikazes in one evening. After retirement, Commander Willis Hardy, holder of the Navy Cross, joined North American Aviation at the Columbus plant and here he provides us some insights from that experience.

The Bald Eagles Reunion Luncheon this year was again a gala affair. The two ladies, Cathy Baker and Sharon Simonsen, and their committee of volunteers provided a very efficient entrance process and a warm and congenial atmosphere during the entire luncheon. Every table was beautifully decorated and added a festive color to the meal! Although the turnout was great we did miss a number of familiar faces. The speaker, Bob Hoover, gave an excellent talk reflecting on his vast experiences flying every aircraft imaginable.

In what must be one of the fastest speaking assignments ever, Hugo Fruehauf flew to Colorado Springs, that evening gave a talk to the AIAA Chapter at the University of Colorado at Colorado Springs; gave two more talks the next day at the USAF Academy bracketing the lunch hour, took a quick tour of the Astronautics Labs and other interesting sights at the Academy and returned home. Bravo Hugo! You reflect that North American Aviation Spirit! We are so proud of you!

My Mother used to say, *"Mundzio, if you ever have a choice of being smart or being lucky, choose lucky!"* Well, a few weeks ago I received a phone call from a subscriber and got lucky! He had read the brief cover story about Jimmy Doolittle and the Tokyo Raid in the Spring 2013 Issue of the Bulletin and he had some comments that he thought I might find interesting since he was an eyewitness to the raid. When I heard his story, I asked him to write it down and he hesitantly agreed. Here is George M. Suzuki's personal story of a historical event that impacted World War II in the Pacific.

North American Aviation Outstanding Cadet Recognition Awards

Photos courtesy of Lt. Col.Scott Nowlin, USAF; Lt. Col. Scott Putnam, USAF; and LTC John Swanson, U.S. Army Reserve

For the fourth year, the North American Aviation Outstanding Achievement Recognition Awards were presented to two United States Air Force Academy graduating cadets in the Aeronautical Department, one in the Astronautical Department and one graduating cadet candidate in the Academy Prep School. These awards are sponsored and endowed by the North American Aviation Retirees Bulletin to be presented each year into perpetuity. In recognizing these outperforming and highly motivated individuals, we wish to foster the very best in the future with the name North American Aviation. We think it is only fitting that the name North American Aviation be associated with our young men and women who have volunteered to serve and defend our great Nation. God Bless them all!



Cadet First Class Evan P. Rishel from York, Pennsylvania, receives the NAA Award for Outstanding Cadet in Aerodynamics from NAA Retirees representative Pete Magoski.



Cadet First Class Zachary H. Adams of Franktown, Colorado, receives the NAA Award for Excellence in Basic Research from Pete Magoski.



Pete Magoski presents the NAA Outstanding Achievement Award for Astronautics Research to Cadet First Class Andrew Hilton from California while being assisted by Colonel Martin France, Astronautics Department Head.



The Outstanding Cadet Candidate at the U.S. Air Force Academy Preparatory School for 2013 was Juan C. Orozco receiving the NAA Recognition Award from our good friend, LTC John Swanson, U.S. Army Reserve. Juan is from Encinitas, California, and has completed an enlistment in the U.S. Air Force

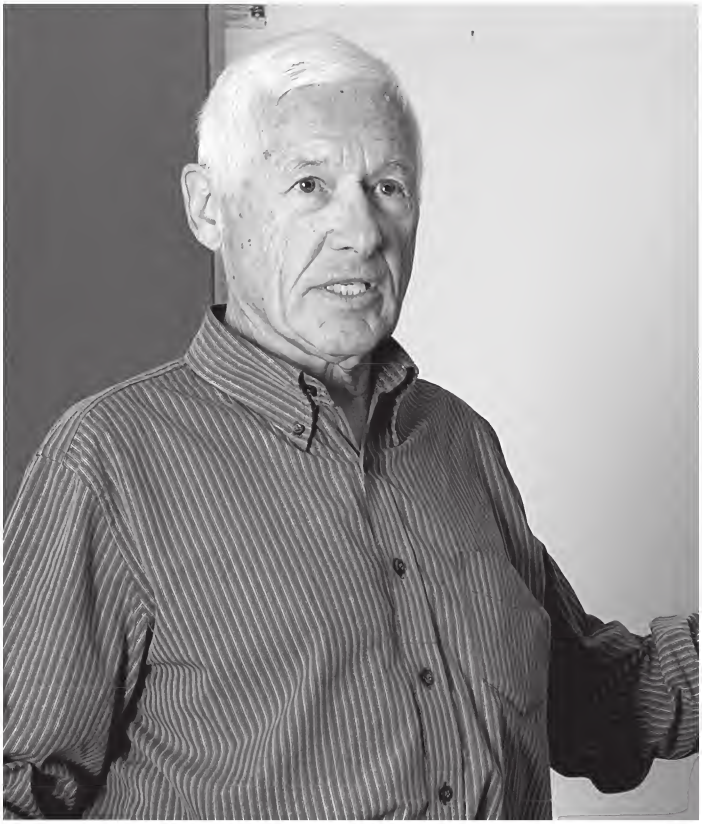
"Know that we are very proud of you… Our leadership team is committed to your success, and there is no Air Force leader, past or present, who does not envy each of you. Now is the time to write a story that lives your dream. Write a story that upholds the core values. Write a story that fulfills your oath of office. Write a story that takes ... this experience and does something great for our Air Force."

— Michael B. Donley
Secretary of the U.S. Air Force
Class of 2013 Graduation Address

Hugo Fruehauf Represents North American Aviation in Lectures at the USAF Academy

In a whirlwind appearance, our Hugo Fruehauf flew to Colorado Springs, Colorado on May 8th. There he addressed a meeting of the AIAA on the campus of the University of Colorado, Colorado Springs that evening on the history of GPS and other precision timing technologies. The next day he repeated the presentation two more times at the Academy to faculty and cadets, was given a tour of the campus and an honorary souvenir silver coin, and finally caught an evening flight home that same evening. Well done, Hugo! You demonstrated the North American Aviation Spirit that distinguished us from all the other companies!





Hugo Fruehauf receives a certificate of appreciation and a USAF Academy Coin from Col Scott Nowlin, Department of Aeronautics Deputy Head, after his briefing to the faculty on the GPS and other timing technologies on May 9th, 2013. This was followed by a tour of the Astronautics Museum and Laboratory.

North American Aviation, Inc.
and the
Rocky Mountain Section of the American Institute of Aeronautics and Astronautics
proudly present a

Faculty Brownbag
with
Mr Hugo Fruehauf
Thursday, 9 May, 1205-1305 in L-2

"A short history of GPS, satellite design considerations, commercial and military coexistence, and the role of atomic clocks in the GPS infrastructure."



RSVP: Lt Col Scotty Nowlin, DFAN, x2619

U.S. Patents
7149308-1, Cryptographic Communications Using In Situ Generated Cryptography Keys For Conditional Access
7120696-2, Cryptographic Communications Using Pseudo-Randomly Generated Cryptography Keys
6590981, System and Method For Secure Cryptographic Communications

Books
Author, ***God Without Dogma***, 2nd Edition, 2010
Co-author, ***Storage Network Security***, IETF/SNIA, 2002
Editor, ***Precision Time & Frequency Handbook***, 9th Ed.





The NAA Columbus Division Stepped Up!

by Commander Willis E. "Bill" Hardy, NC, U.S. Navy, Ret.

NAA Columbus Aircraft Division (CAD)

Upon retirement from the U.S. Navy in 1959, I joined the Columbus Aircraft Division as a Field Service Representative on the T-28B and T-28C Trojan Trainers program. The T-28C was a naval version suitable for Aircraft Carrier Catapult launching and Tail Hook arrested landings. Having completed the T-28B and T-28C production, some smart marketing resulted in capture of the T-28D conversion contract that encompassed gathering up all of the surplus surplus/retired T-28As in civilian hands and remanufacturing them into a Tri-service light combat aircraft for then friendly third-world countries. This was a natural since CAD had all the supply lines in hand for retrofitting the tired T-28As with big zero time R-1820 engines, some Government-furnished under-wing racks and forward firing machine guns. This program subsequently led to the design and production of the Tri-service OV-10 Bronco turbo-prop light attack and observation aircraft. I was consultant on the cockpit design for this aircraft and conducted the official cockpit (mock-up) review by a committee of Army, Navy/Marine and Air Force pilots. This aircraft was in service with the Marine Corps for years into this century and is still on duty with the U.S. Forestry Service.

For my next task, I was assigned to the Integrated Maintenance Management Team (IMMT) as Project Manager on the A3J-1 Heavy Nuclear Attack Bomber contract, representing the Director of Quality Assurance and Logistics (QA&L). This was a nuclear delivery vehicle, so the function came under the purview of Strategic Air Command (SAC). All my A3J functional people, including Field Service, Publications, Supply Support, Training and Test equipment, were segregated in a Top Secret secure work enclosure with specific Security Badges required for admittance. The A3J was a Mach 2 bomber with two J79 afterburner equipped engines. It was the heaviest aircraft to operate from Essex Class Aircraft Carriers. The bomb was housed in a unique centerline linear bomb bay. The bomb was attached to several 300-gallon fuel tanks. This "train" was ejected between the exhaust nozzles, riding on rollers/track nearly the full length of the fuselage. This made a long substitute for tail fins, enabling the deep penetration of the shape at the lower end of the stack. The A3J was equipped with an early phased array radar and a very sophisticated Autonetics inertial navigation system, the heart of which was a highly classified Verdan digital computer. Although it was a very advanced nuclear delivery system, its use to the Navy became academic when the DOD declared that the heavy strategic bombing function was assigned solely to SAC of the U.S. Air Force. Thus, the Navy contract for further A3Js was canceled. However, some fast footwork by CAD engineering effectively saved the A3J from the scrap heap, by designing into its basic airframe a very revolutionary recon system and redesignating it as the RA-5C. Note that for both, the A3J and the RA-5C, the nomenclature *Vigilante*, remained and they were informally known as *"Vigies"*.



U.S. Navy photo

***A North American A3J-1 Vigilante conducting initial carrier suitability tests aboard the* USS Saratoga.**



U.S. Navy photo

Originally designed as a nuclear attack bomber, the Vigilante evolved into a sophisticated and capable high-speed reconaissance aircraft, the RA-5C.

The new Navy designation for the total recon system was the "Integrated Operational Intelligence System" (IOIS) for the RA-5C and the Integrated Operational Intelligence Center (IOIC) for its supporting Carrier component. The new Intelligence suite in the RA-5C included an 18" Panoramic Camera that scanned from horizon to horizon, 12" Oblique Cameras Forward, Aft, Left and Right plus a Wide Angle Vertical Camera. A highly classified Photo Flash system was provided for night use by appropriate cameras. On several night test flights out of Columbus and over Cleveland stadium, we could read the names on the backs of the team players when they were in a huddle. UFO sightings were attributed to this flash system. All film was 9" high resolution Positive Color. All readouts included a Lat/Long locater in each frame that could be trackballed by the IOIC operator to any point on the frame for a correct Lat/Long record. Other sensors included a new high resolution Side-Looking Radar under the fuselage, along with highly classified active and passive ECM. Updated/improved sub-systems from the basic A3J included the forward Radar & TV, the Inertial Navigation System (INS) and latest dash numbered J79 Engines and Burners. On WestPac deployments, we heard that the "Vigie" could leave the Carrier and go up into Laos and back at an undisclosed profile that precluded fighter escort. The Vigilantes set several speed and attitude/payload records, but after conversion to the RA-5C version, it was the first Naval aircraft to exceed 100 maintenance man-hours per flight hour due to the necessity to download some of the recon black boxes from the linear bomb bay to do such mundane things as repairing fuel and/or hydraulic leaks. Accessibility was thence highlighted in Naval Aircraft design requirements, but it took some time to force designers to avoid putting components out of reach of Organizational Maintenance technicians. We are pleased to note that follow-on versions of our RA-5C recon sub-systems went on for many years in the SR-71, even though we lost the airframe contract to the Lockheed Skunk Works.

Having previously been the Exec of the Navy Carrier based Fighter Squadron VF-51, flying the Columbus designed and manufactured FJ-3M, I took particular notice of Fighter Aircraft production at Columbus. First, in all fairness, it should be noted that although the Los Angeles Division was designated as the Air Force Aircraft Division and Columbus as the Navy Aircraft Division, more than 700 F-86Fs and 475 F-86Hs were subsequently manufactured, test flown and delivered to the Air Force from the Columbus Division!

The first NAA Navy Fighter, the FJ-1 Fury, was short lived, having experienced only one Carrier Deployment, when it was superseded by the FJ-2, a beefed-up version of the F-86. We called the -2 the "1,400 pound paint job" because it had a Navy paint scheme and weighed 1,400 pounds more that its F-86 predecessor. All 200 FJ-2s, with some of the catapult/tail-hook gear removed, ended up as land based Marine Corps fighters. Catapult hooks plus the tail hook, with their respective internal structural requirements, enabled the FJ-2 to withstand the carrier launch and arresting gear stresses but cut its range and payload to unacceptable level for Fleet use.

CAD incorporated major modifications, including the improved "6-3" swept wing and the higher thrust J65 engine, to manufacture the carrier-suitable FJ-3 version of the Fury. During my earlier tenure with the FJ-3, it was upgraded to the FJ-3M configuration by the addition of under-wing stores racks



U.S. Navy photo

Two Furies: A straight-winged North American FJ-1 flying next to a swept-wing FJ-2 in 1952.

and full Sidewinder AIM-9 capability. Another improvement during my time included the addition of a "drop-out" air driven hydraulic pump to preclude the necessity to bail out whenever the early J65s threw a compressor or turbine blade. Other field improvements included the liquid oxygen (LOX) supply, double-bubble blades in the J65 engine and Mach 1 flying tail assembly. All in all, it was a pleasure to fly and could outsmart the faster Century Fighters in the hands of a good old WWII Navy fighter pilot.

The last of the Columbus Fury series was FJ-4, an all-new light attack version of the FJ-3M, with significantly improved payload and range capabilities. Alas, after a few short years in the fleet it was overtaken for the long-term light attack mission by Ed "Heinemann's Hot-Rod", the Douglas A4D. After the FJ-4 the Columbus manufacturing/production was kept very busy producing such assemblies as the aft fuselage sections for all the Vought F8U "Crusader" series and large milled & shaped skins for Boeing. Columbus' early proficiency in forming/machining titanium, along with some of the industry's largest skin milling and forming machines enabled a lucrative business manufacturing pieces of aircraft for other factories. This also included a brief foray into the manufacturing of high-rise building aluminum facades called Curtain Wall.

NAA Missile System Division (MSD)

This Missile Systems Division was established at Columbus in the early 1960s, co-located with the Columbus Aircraft Division (CAD) and utilizing the existing Manufacturing, Flight Test and Quality Assurance and Logistics (QA&L) Departments. The MSD president and his staff, along with the MSD Engineering were housed separately. As in my CAD assignment, I was again responsible to two bosses, namely: I functionally reported directly to the CAD QA&L Director as the QA&L Project Manager on the MSD Condor AGM-53 Missile Program. I reported to the Condor Program Manager for all QA&L functions. If this is a bit confusing to the reader-join the club. There were a number of heated discussions in the Condor Program Manager's staff meetings wherein I had to single handedly defend against reductions in my allocated QA&L budget to support over-runs in the design engineers' budget. Unfortunately, the Program Manager was an ex-engineer, so there you have the disadvantages of being a Project Manager in enemy territory!



U.S. Navy photo

An AGM-53 Condor missile mounted on the wing pylon of an A-6 Intruder

Back to the Missile product: The Condor AGM-53 was reportedly the first "Launch and Leave" tactical missile in the world and possibly the most expensive, $50M of which went to our airborne (secure) K-band Data Link sub-contractor. Most of the system was very highly classified, as was my previous RA-5C project, so my Navy TS Clearance was utilized once again. It took quite a while to get security clearances for all of my functional people with a "need to know". This was a significant step forward in tactical missile control. The missile consisted of the Guidance Section, with the television camera in its nose, followed by the Warhead, with the Propulsion Section bringing up the rear. The TV camera was an early high-resolution device with a zoom lens that was viewed and remotely controlled by the GiB (Guy in Back) in the parent aircraft, via the two-way data link at the upper aft end of the missile. This was a giant step forward in tactical missile control, in that the visual closing in on the target enabled the remote operator to more finely tune the aim-point!

The final Condor test flight was a typical scenario for this tactical "launch and leave" missile. A retired Navy Destroyer was anchored at an undisclosed site West of San Clemente Island. An F3H-1 Navy Fighter, bailed to NAA, was scheduled to depart NWS China Lake to attack this environmentally sanitized target. Upon reaching the Pacific coastline, the GiB was able to zoom-in on the Island, launch the Condor AND direct the Pilot to reverse course for home. The GiB then saw and locked-on the target at 60 nmi range. Note that the launch aircraft was now heading in the opposite direction from the target, thus the "launch & leave" sobriquet. Shortly, he was able to change the aim point to a hatch left open as the entry point for this test. The warhead detonated mid-ship and completely severed the hull. With all the compartments closed, the halves of the ship were connected only by the flexing conduits and plumbing. When the photo crew went out early next morning to survey the damage, the ship had sunk with nothing showing on the surface due to the prior careful removal of all fuel and combustibles. So ends our story of this newly developed Missile System, it was turned over to a friendly nation on the eastern Mediterranean Sea.

Several other Tactical, Target and Anti-missile Missiles were developed and/or manufactured by MSD, but I was not involved and cannot now find any MSD survivors to tell us about them.

Collins Communication Systems Division (CCSD)

CCSD, a part of Collins Radio Co. which was acquired by the Rockwell International Corporation in 1973, was my next and final assignment. But that is a story for another time.

About the Author: Born on a ranch near Corning, California, he joined the Navy after high school in early 1939. Completing "Boot Camp", he continued to advance through the Aviation Machinist Mate ranks until he was accepted as a Naval Aviation Cadet and received his Wings and Commission at Corpus Christi in late 1943. Assigned to Fighter Squadron VF-17, the Jolly Rogers, aboard the USS Hornet *in February 1945, he took part in the Iwo Jima invasion and the Okinawa campaign, flying protective cover over the fleet, where on April 6, 1945 he shot down five Kamikazes in one evening. Retiring from the Navy in 1959, Bill joined NAA/Rockwell in Columbus where his story commences. Noteworthy, he is the holder of the Navy Cross and he is the Vice President and Director of the American Fighter Aces Association. Commander Hardy currently resides in San Juan Capistrano, CA with his charming wife, Marilyn.*



Photo from the Hardy Collection

Bill Hardy briefs the Secretary of the Navy, John W. Warner, following Bill's Condor Missile presentation at the Navy Department in Washington, D.C.



Photo from the Hardy Collection

Lt Willis Hardy checks out the Vought F4U Corsair after Fighter Squadron VF-17 returns from a combat cruise where they flew Grumman F6F-5 Hellcats.

Second NAA Memorial Bench for the U.S. Naval Air Museum at Pensacola in Negotiations

by Ed Rusinek

As previously reported, the NAA Memorial Bench for the USAF Museum in Dayton, Ohio has been ordered and is in the process of being engraved. With adequate funds already donated, our contracts chairman, Nolan Leatherman, contacted the National Museum of Naval Aviation at Pensacola, Florida and he received a most welcome approval by the museum chairman, Captain Ed Ellis, for a comparable memorial bench. Captain Ellis will present this project to the Museum Board and with their approval will send a letter of consent for the bench. Upon receipt of the letter, we shall order a duplicate bench with the list of NAA aircraft, missiles and control programs delivered to the U.S. Navy. Although we have enough to order both benches, we will need a few hundred dollars more for maintenance fees and shipment delivery costs to Pensacola.



Continued List of Donors for North American Aviation Memorial Benches

Name	City	Division Affilliation	Rememberance
Robert & Norma Petersen	Cameron Park, CA	Corporate	In Memory of My Friend, Kenneth B. Gay, Atomics Intl
John J. Garvey	Reynoldsburg, OH	Columbus	In Loving Memory of My Father, John J. Garvey, Brooklyn Navy Yards
Jacob A. "Jake" Borror	Columbus, OH	Columbus	
Joseph S. Juwasha	Pomona, CA	Marine Systems	
Stanley E. Thimakis	Tustin, CA	Autonetics	
Edward C. Perkins	Rancho Cucamonga, CA	Autonetics	
Kenneth T. Kubota	Orange, CA	Autonetics	
Peter Galovich	Rancho Palos Verdes, CA	LAD	
William D. Padian	Torrance, CA	LAD	In Memory of Structures Director Bill Graziano, LAD
Maxine S. Haun	Irvine, CA	Autonetics	In Memory of Ken Kellough and Estelle Albaugh, Founders of the NAA Recreation & Welfare Program
Erwin A. Ulbrich	Whittier, CA	Columbus/ S&ISD	
Charles H. Lowry	Garden Grove, CA	S&ISD	
Ann Tack	Huntington Beach, CA	S&ISD	In Memory of Richard W. Ziska, USN (Ret)
Gordon & Mae Eno	Corona, CA	S&ISD	In Memory of Gordon Jones, Al Barbuscia, John Seawoster and Robert Solar, S&ISD
Virginia C. Carlson	Las Vegas, NV		
Lawrence J. Korb	Orange, CA	S&ISD	
Ralph D. Guymon	Orange, CA	Autonetics	In Memory of John Nestor, Autonetics
John W. Sandford	La Jolla, CA	S&ISD	In Memory of Bill Snelling, Columbus
Melvin C. Hove	Huntington Beach, CA	S&ISD	
Don MacGregor	Huntington Beach, CA	S&ISD	
Frank H. Beckman	La Mirada, CA	Satellites	
Charles H. Johnson	Pataskala, OH	Columbus	In Memory of the Columbus Field Operations Technical and Logistics Representatives
	Previous Total Donated	$8,525.00	
	Total Donated to Date	$10,655.00	

That Warm April Day In 1942

by George M. Suzuki

The cover story in the Spring 2013 Issue of the NAA Retirees Bulletin about Lt. Col. Jimmy Doolittle and the B-25 Tokyo Raiders awakened memories going back 71 years. I was an 8th grader at the Tokyo 10th Middle School located in the western part of Tokyo, and WWII was about five months old. It was Saturday, April 18, 1942. The schools in Japan were on a 5 ½ day schedule. Therefore, we were out of the classes at Noon. The weather was clear and warm, a beautiful spring day. My home was located about a mile and a half west of the school, so I was commuting on foot with friends who lived near my house. Since the next day was a Sunday, we were walking and playing rather slowly over a 30 feet wide dirt road which covered huge ducts supplying water to the city.

About 12:30 p.m., we were almost at my house, when we suddenly noticed a large dark green airplane in the northeastern sky. The plane was about one mile away from us and very low, 1,500 to 2,000 feet altitude, traveling slowly south in the direction of Yokohama. It had 2 engines, 2 vertical tail fins, and we did not see any insignia. It was an entirely unfamiliar aircraft. The plane was in our sight for several minutes, then, we heard an air-raid siren and sporadic antiaircraft guns firing in the east. Now we realized that the plane was American. We saw a few white puffs near the plane but it kept its course and flew out of our view. There were no other planes in sight. By the time I got into my house, the radio was announcing that a few American bombers invaded Tokyo airspace from various directions and dropped bombs, then were fleeing southwest toward China. The evening news reported that more than 10 American B-25 bombers invaded the Tokyo sky, dropped a few bombs and machine-gun strafed the Tokyo/Yokohama area. The incurred damage was very light. In next morning's paper, there were similar headings but no picture of damages nor of victims. The whole thing was played down with no comment on the lack of air defenses over Tokyo. Many people outside of the bombed areas did not even know the raid happened. The actual damage was never issued, but an unofficial newspaper account came out in October 1942 which indicated: 39 dead, 307 injured, and 160 burned houses.



U.S. Navy photo

B-25Bs of the Doolittle Raid run up their engines on the* USS Hornet *enroute to Japan.

After the April 18, 1942, B-25 Tokyo Air Raid and the June 6, 1942 Battle of Midway, the WWII war was fought primarily in the South Pacific and South-Eastern Asia. The Tokyo Area was relatively quiet until Summer 1944 when the B-29 was introduced. Then, I experienced the March 10, 1945 incendiary bombing of Tokyo by the B-29s, and the June-July, 1945 Pacific Coast battleship shellings by Task Force 58. However, the April 18, 1942 Tokyo Raid was my first direct encounter with WWII, so I started to look into the detailed facts when the war was over.

As everyone knows, the raid was initiated at the highest level of U.S. political and military ranks to boost American morale and impact the Japanese aggressive war psychology. Actually, the Japanese military had been expecting that the U.S. would attack major Japanese military and industrial centers by aircraft carrier fleets. Hence, when the U.S.-Japan Government negotiation in Washington became hopeless in late 1941, the Japanese Navy enlisted small fishing boats, 80 to 150 ton, to establish a picket boat fleet. Several hundred fishing boats were manned by a regular Navy NCO as commander, with a few trained Navy signal seamen, and boat engine crews and deckhands. When the negotiations became unsuccessful, war was declared and the boats were sent out. The picket boats patrolled their assigned section of the picket line for one week, then returned to the mother port for maintenance and resupply. They were forbidden to send out any radio messages unless the boat spotted the U.S. fleet.

Around April 9, 1942, the Japanese military detected increased activities at Pearl Harbor, followed by the aircraft carrier *USS Enterprise* departing from the Harbor and heading north and accelerated aircraft movements in the Aleutian Islands. The Japanese thought it might mean another sea battle in the South Pacific, but did not expect a raid on the Japanese Mainland. On the morning of April 18, 1942, the picket boat *No. 23 Nitto Maru* was heading west toward its mother port in Hokkaido after one week of patrol duty. At 6:30 a.m., a lookout sighted two aircraft carriers heading southwest, about 700 miles from Tokyo. At 6:50 a.m., the *No. 23 Nitto Maru* lookout spotted the U.S. Fleet including 2 aircraft carriers and sent a message to the Japanese Navy. Immediately, the boat was attacked by the *USS Nashville* and sunk. It stopped transmission at 7:02 a.m. The incident forced Vice Admiral Halsey to change plans and to launch the B-25 bombers immediately, rather than wait until the fleet would arrive at the original set point of 500 miles. The first B-25 was launched at 7:35 a.m. at about 660 miles out of Tokyo. Before 9:00 a.m., all 16 B-25s were launched and flew off toward Japanese target cities. The U.S. Fleet turned east to evade a Japanese defense force attack and to return to Pearl Harbor. At about 12:30 p.m., the Fleet encountered another Japanese picket boat, the *Choto Maru,* and immediately sank it and took 5 crewmembers as prisoners.

Upon receiving the spotting of the U.S. Fleet message from *No. 23 Nitto Maru*, the Japanese Navy went into action and estimated that the raid would be in the early morning on Sunday, April 19, 1942. The Japanese Navy assumed that the raid would be conducted by carrier-based aircraft and the carriers would wait to retrieve the aircraft after the raid. Based on these



U.S. Navy photo

The Imperial Japanese Navy picket boat* No. 23 Nitto Maru *was attacked and sunk by the light cruiser* USS Nashville *after reporting the sighting of the U.S. Fleet.

assumptions, the Japanese Navy issued alerts to the key Naval installations at 8:37 a.m., April 18, 1942 and at 10:00 a.m., the Navy dispatched a reconnaissance plane toward the location the *Nitto Maru* reported. Also, the Navy positioned 24 fighter planes over Tokyo. The Japanese Army did not have its own direct information source, but also sent up 27 fighters. At 11:30 a.m., the Japanese Army sent out 3 attack bombers to the Pacific Ocean to locate the U.S. Fleet, assuming the Fleet was still heading south. At 12:00 Noon, the Japanese fighter planes ran out of fuel and started landing. Also, at 12:00 Noon, one of the Pacific coast watch towers, a ground force installation, spotted an American bomber north of Mito, about 65 miles northeast of Tokyo. The Japanese Army thought the sighting was in error having assumed the location of the U.S. Fleet and the size of the B-25 compared to carrier based aircraft, thus reacting slowly.

After refueling, the Japanese Navy and Army sent out approximately 40 fighter planes. But they could not find the U.S. bombers, because the fighter planes went up to several thousand feet altitude level and expected to see the bombers in formation, but the bombers were close to the roof top level and flew individually. Basically, defending outside of the coastline was the Japanese Navy's responsibility and inside the coastline it was the Japanese Army's responsibility. Since there was no close coordination at the operations level, both services repeated the same mistakes.



U.S. Navy photo

B-25s take off from the deck of the* USS Hornet, *beginning the historic attack on the Japanese mainland.

The ground defense forces located around cities were made up of veteran leaders and inexperienced soldiers, most of them never having fired live ammunition before. Also, some groups were concerned about the unexploded shells landing on the civilians below. In any event, there were practically no defensive actions taken by the Japanese military and no damage sustained by the raiding bombers.

Due primarily to the Japanese government edict, the post raid news in the communication media was sparse, and the event was forgotten by the general public in a few weeks. However, the raid created significant impressions among the government leaders. Particularly, Admiral Isoroku Yamamoto, who headed the Japanese Combined Naval Fleet, thought it was his responsibility to protect the Japanese coastal lines, which had been violated by the U.S. Fleet and allowed the B-25 bombers to penetrate deep into Japan on April 18th. So he pushed strongly to move the line of patrol further east, and to include the Western Aleutian Islands and Midway Island. Such a plan had existed before, but due primarily to the Japanese Army's objection based on the logistics and priority, the plan had been shelved. The Japanese military successes in the initial phase of the war and the April 18th Tokyo Raid had changed their emotional balance, and the Midway Island Occupation Plan was put into action May 5, 1942. As we know, the operation was a disastrous failure to the Japanese Navy and considered to be the turning point of the WWII in the Pacific.

I don't know how much credence historians have given to the Doolittle Raid with respect to the subsequent developments of World War II. However, I would like to say that "it was a real turning point making event". It displayed the characteristics of two great military powers, and helped predict the outcome of future operations. The impact of April 18, 1942 went far beyond building U.S. morale and crushing the Japanese war psychology. It gave us a lesson that flexible freethinking and good cooperation between the U.S. Army and Navy defeated the tradition bound narrow minds and poor cooperation between the Japanese Army and Navy on their own home field.

About the Author: George was born in 1928 in Culver City, California. His parents moved the family to Japan in 1934. He graduated in 1950 from Tohoku University in Sendai, Japan and received an Engineering B.S. degree from UCLA in 1954. After two years as a project engineer at the AFFTC, he served for 33 years at Rocketdyne and retired in 1989 as a project manager. He subsequently served as a consultant at Rocketdyne for five more years. George currently resides in Northridge, CA.

NASA's Mission: Explore Space

by Walter Cunningham

U.S. lawmakers face increasing difficulty defending the NASA budget, which should be growing, not shrinking. The media enthusiasm for so-called "commercial space companies," is making it more and more difficult for NASA to stay in the space launch business.

Commercial space industry lobbyists Robert Walker and Charles Miller recently wrote an opinion piece calling on President Barack Obama to cancel America's planned exploration-class launch vehicle, the Space Launch System (SLS), aimed at restoring our nation's ability to send astronauts beyond Earth orbit for the first time in over 40 years. *"Just as the government does not design or build automobiles, ships, trains or airplanes,"* they said, *"NASA should not be designing, building or launching rockets to go to low Earth orbit."*

They must have forgotten that it was the individuals and companies who invented automobiles, ships, trains and airplanes, who then went on to design and build them. It was government agencies and the military that created, designed, built and launched rockets.

NASA is a civil space agency, and it has been encouraging the commercial use of space for the last 30 years. If NASA had not been designing, building and launching rockets into low Earth orbit for the last 50 years, private industry, today, would not be attempting to commercialize what was, until recently, the unknown frontier of space exploration.

While private enterprise is one of our nation's greatest assets in virtually all fields of endeavor, private investment in private industry can be justified only when a private (non-governmental) investor can make a reasonable return on his investment in a reasonable period of time. The exploration of space is still too risky and too costly for any truly commercial venture. "Commercial space companies" never would have gotten us to the Moon.

Because of the tremendous cost and very distant economic returns, if ever, space exploration will never be performed by commercial companies. NASA was motivated by non-commercial objectives to explore the new frontier, which enabled the agency to develop the technology being utilized in today's commercial space community. These are not yet truly commercial, being mostly funded by government grants and contracts-contracts that differ from those of the private companies that built most of the NASA hardware over the years. "Commercial space companies" today are selling services based on techniques perfected by NASA over 40 years ago, and without government contracts, they would not be making it.

As the technology developed by NASA has moved slowly into the commercial world, the returns have been tremendous. Now lobbyists for today's commercial space community are trying to get NASA out of the space launch business, which they see as competition. Everyone knows that NASA is no longer in the business of building rockets to go to Earth orbit, it is focused on moving us out into the solar system.

Nothing in the world is even remotely comparable to NASA's Space Launch System, which is designed to explore beyond Earth orbit. The SLS program has been under great funding pressure. When President Obama proposed cancelling NASA's programs to build government-designed rockets in 2010, it was not just to encourage the private sector. It was to get NASA out of the human space exploration business. Now, the president may be planning-perhaps as early as this year-to kill the Space Launch System. Efforts



to make changes at NASA should not be to move the agency out of the space exploration business; they should be to reduce the internal bureaucracy and get NASA out of all those activities it has evolved into that are not essential to space exploration.

As the most powerful launch vehicle ever to fly, the Space Launch System will enable missions beyond the capabilities of other rockets, such as sending astronauts into lunar orbit, speeding large robotic probes through the outer solar system and ultimately, launching the missions that will finally allow human beings to take their first steps on Mars.

We need to continue expanding our frontiers and developing the necessary technology, which private industry can exploit to generate returns in the future. While private industry may not be able to afford to explore our space frontier, commercial rocket companies can utilize and exploit technology much more efficiently than government agencies. As commercial companies move closer to that capability, NASA must expand on its pathfinder role, blazing a new trail and extending humanity's territory beyond the near-Earth orbit to which we're currently limited. The Space Launch System will pursue objectives that private industry cannot, making the vital investments for which there is not a viable business model for commercial exploitation.

Unless we are content with a space program that only repeats what NASA accomplished years ago, we must invest in programs like the Space Launch System to blaze new trails into the solar system. For America to continue to lead the way in space exploration, we need to move out the space frontier, opening up new worlds of economic opportunity. Exploration of the space frontier requires breakthroughs in technology that gives birth to commercialization.

It's up to NASA – not "commercial space companies." NASA's motto should be, quite simply, ***"We Explore Space."*** The Space Launch System is a rocket that will make those journeys to our space frontier possible.

About the Author: Astronaut Walter Cunningham has enjoyed multiple careers in the United States Marine Corps, with NASA and in private industry. In 1967, he was a member of the backup crew for Apollo 1. With the loss of the prime crew in the fire on the pad, he was assigned to the first manned flight of the Apollo Program – Apollo 7. Apollo 7 was the longest, most ambitious and most successful test flight of any new flying machine – ever. Following the Apollo 7 mission, he served as Chief of the Skylab Astronauts. A retired Marine Corps fighter pilot with the rank of Colonel and 4,500 hours pilot time, Walt is a successful business man, entrepreneur, venture capitalist, lecturer, radio talk show host of "Liftoff to Logic" *and author of* "The All-American Boys" *about the golden age of manned space flight.*

Bald Eagles 51st Anniversary Reunion

Photos by Lee French and Nenita Miyata



Bald Eagles President
Erik Simonsen



Guest of Honor
R. L. "Bob" Hoover



Mike Luciano and Hank Francovig



Bob Hoover receives an F-86 scale model as a token of thanks from the Bald Eagles



Stan Guzy
Board of Directors Sergeant at Arms



Bert Puskas and Marilyn Spooner



Toby and Frank De Mattia



Ellsworth and Lani Chan were one of the raffle winners of tickets to the USS Iowa Museum



Mary Leone and Rubye Ritchie



Nancy Williamson, Bev Gresham, Ann McLure, and Eva Beth Thomas



Mike and Paddy Matthews



Susan Boldt and Pat Cunningham



Pat and Sharon Cowley



Shirley and Amby Baccaro



Sheila Pitts, Dave Rouze, and Georgiana Winden



Sonnie Robertson and Cathy Baker



Clarence Baisdon and Janet and Dick Bisby



Donna and Rusty Russell and Carolyn and John Van Camp



Lee French and Tore Johnson



Matt Dougherty and Nenita Miyata



Tom and Penny Ellis

An Ode to Adam and Others

by Edmund Rusinek

Much has been written about the first Moon Landing. Now, in my sunset years, I was thinking how far we came in such a very short time to accomplish that tremendous feat. To give you some perspective of what I am talking about, let me go back to February 25, 1951. That was the day I arrived here at the North American Aviation Aerophysics and Atomic Energy Laboratories in Downey, California. I was assigned to the Stress Group, given an ancient decrepit desk, a pad of vellum and a No. 2 pencil. My lead engineer, Trevor Williams, came over and asked me if I knew what I would be working on. Since it was a Top-Secret project, I didn't have a clue. He took me across a small courtyard to a test site where a full scale Navaho X-10 was being structurally tested. I ran my hand over the surface and didn't recognize the metal. ***"That's stainless steel"***, he remarked. Noticing the two nacelles over the Canard Wing, I asked, *"And is it powered by jet engines?"* His response startled me, ***"It's powered by two ram jet engines"***. I didn't even know that ram jet engines had been advanced this far. *"Don't you have to have them moving to light them off"*, I asked. ***"The Navaho rides on the back of a booster and the engines are lit when it achieves altitude and speed"***. *"What's the booster made from?"* ***"It's two tanks are made from cylindrical aluminum plates welded together with a rocket engine at the end."*** As we walked back to my desk, the thought struck me, I spent four and a half years at the University of Michigan studying to be an engineer and now I am working with a material considered too heavy, a propulsion system that never got beyond an experimental lab exercise and using a welding technique that was always considered an absolute no-no. We came back to my desk and Trevor dumped a stack of blueprints on my desk and said, ***"Here, do the stress analysis on the X-10 Nose Gear Door"***.

Incidentally, I might add that although the new division in Downey was much smaller than the Los Angeles Division, we had a tremendous amalgamation of characters that even Hollywood could not conjure. It started with the original Vultee engineers that came with the building when NAA moved in, a group of NAA engineers that came over from LAD including a few of the original Dundalk group, and a number of English "Battle of Britain" engineers that immigrated to the USA via Canada. They included a British Navy pilot that flew an ancient Swordfish torpedo plane that disabled the German pocket battleship *Bismarck*. Add to this "cast", a German fighter pilot from World War I and the German scientists from Peenemünde that came over with von Braun. Finally, the American veterans from World War II, many already fully trained as pilots and responsible leaders, with GI Bill degrees in engineering completing the list!

In 1955, we had lunch hour sessions in the Assembly Room. Everyone brought a sack lunch and someone would volunteer to present his ideas and the rest of us would ask questions and offer suggestions. One of these speakers was Adam Zahorski. He was a senior engineer from Poland and one of his distinctions was that he made the first parachute jump in Poland in the 1911-12 timeframe. He limped with a cane so our impression was that the jump was not a total success. Anyway, he proposed that the Company form a new group to determine what it would take to keep a man alive and to function in a total outer space environment. At the time, we were building a vehicle to fly at Mach 3 and that was considered an achievement! We scoffed at his idea of man capable of flying at Mach 25! Adam left our company in disgust and joined Studebaker-Packard Aerospace.

Two years later, the Russians launched Sputnik and the Space Race was on! From a beeping satellite it soon advanced to man himself. And the questions arose! What does it take to put a man in Space and keep him alive and functioning?

In 1969, Neil Armstrong stepped onto the surface of the Moon. In sober reality, it was only 14 short years from Adam Zahorski's sack lunch proposal to that important day for man and mankind!

I close this soliloquy with a final salute to Adam with an apology for doubting his brilliance and to all the people that picked up the tab for that magnificent achievement. First, the three Astronauts we lost in the fire on the pad, followed by those that died here on the job and those that were carried out of here and never came back. Then, those whose families collapsed and marriages dissolved because of the constant pressures and long separations. Finally, those that took the rap for our failures and lost their careers because NASA, the Customer, could never be wrong. Over the years, their names have started to fade from my memory but I still see their faces. Many were my colleagues and several were good friends.

Congratulations and Best Wishes to

Paul and Marian Moynihan of Placentia, California
celebrating their 57th Wedding Anniversary

George and Louise Page of Fullerton, California
celebrating their 56th Wedding Anniversary

Robert and Norma Petersen of Cameron Park, California
celebrating their 53rd Wedding Anniversary

Stephen and Sheila Evans of Foothill Ranch, California
celebrating their 50th Wedding Anniversary

Contrails From The Past

by Ed Rusinek

Dear Ed,

Thank you for the fine job you and the staff are doing with the Bulletin. I was happy to see the great response to request for donations to fund the Memorial Bench at Dayton. If you wish to transfer the surplus funds for a memorial at Pensacola, feel free to do so with my donation. I served four years in the Navy during Korea, and our son, Patrick, got his Wings at Pensacola and flew the S-3A off the *USS Dwight D. Eisenhower* for two three-year tours. He is out of the Service now as a full Commander.

I do have one correction on the List of Donors. The person to be remembered by Marian and I was E. E. "Al" Dale. You had D. D. "Al" Dale. If space permits, I would like to add Jack Nunnally, the F-100 test pilot that flew the chase plane during the "Hound Dog" program and Carl Scheuplein who served with me at Huntsville MSFC during the Saturn S-II and Space Shuttle programs.

—Paul Moynihan, Placentia, CA

Ed's Ans.: Ouch! I worked with Al Dale on the Navaho Program. He was the engineer responsible for the APS system which involved two competing APUs being developed by Walter Kidde and Thompson Products. If I don't sharpen up, people will think I am getting OLD! Congratulations on having such a fine son!

Dear Ed,

We just got home from the 51st Bald Eagles Reunion, and we have to express our appreciation for the exceptional effort that goes into making each Reunion memorable. Each of the "volunteers" who put countless hours to ensure everything runs smoothly is to be commended. You have certainly carried on the North American Aviation tradition of conscientiousness to every little detail – You are a "Well Oiled Machine"!! We look forward to our 52nd Bald Eagles Reunion next year.

—Tom & Penny Ellis, Palmdale, CA

Ed's Ans.: Although the NAA Retirees Bulletin is a separate entity, we are only too glad to pass along this thoughtful compliment to Sharon Simonsen and Cathy Baker and their exceptional staff of volunteers on the splendid effort they put forth each year. Bravo!

Dear Ed,

Enclosed is my check for the Naval Bench. I was the Crew Chief for Production Flight Test at the Downey facility. We built and delivered to the Navy twelve AJ-1 Savage bombers from that plant between 1949 and 1951. The first production flight was in May 1949 with first delivery to the Navy in September 1949 and the first carrier take-off from the *USS Coral Sea* on April 21, 1950. The ongoing contract was transferred to the Columbus plant in 1950.

—Frank H. Beckman, La Mirada, CA

Ed's Ans.: Thank you for your very generous contribution for the memorial bench. I remember when I came to Downey in February 1951 the last of the AJ-1's were being rolled out.

Received At Press Time!

Our Bulletin Representative, Nolan Leatherman, received word from Dodds Monument, the granite bench contractor, that the North American Aviation memorial bench is complete and has already been delivered to the National Museum of the United States Air Force.

Nolan shall meet with representatives of the museum to determine an appropriate date in August to have the memorial dedication ceremony. All those interested in attending are strongly urged to notify the Retirees Bulletin of their intent to attend including retirees, family members of silent majority retirees, military and retired military personnel, and those who loved the sound of a P-51 making an overhead pass.

Since the next bulletin is scheduled in September, a special flyer will be mailed out to all subscribers providing the actual date and hour for the ceremony. Those intending to attend who are not subscribers will also receive the notice if they notify the Bulletin in advance! Please send your request for a flyer to the NAA Retirees Bulletin, P.O. Box 3797, Seal Beach, CA 90720.

The Silent Majority

by Stan Guzy

ASHMAN, WILLIAM, 85 – a belated report of his passing on February 11, 2012. His military service in WWII provided interment with full military honors. Bill joined LAD in 1946, went to Autonetics and then returned to LAD on the B-1 program before transferring to Hanford, WA and, finally, to Rocketdyne where he retired in 1987 with 41 years of service. He is survived by his devoted wife of 66 years, Lillian.

BEALL, JAMES E., 76 – passed away peacefully at home in Lancaster, CA on April 13, 2013. After serving in the U.S. Navy on the *USS Hornet* during the Korean War, he came to LAD as a photographer. His assignments included programs at Space Division and Palmdale and several locations with the B-1B program. Upon retirement, he joined the Los Angeles County Sheriff's Office as a Volunteer on Patrol in Lancaster. He is survived by his wife of 32 years, Joan. She is also an NAA Retiree.

BIDDLE, MILBURN E., 95 – died peacefully on July 18, 2012 in the presence of his family in Redding, CA. After military service, he came to LAD and worked on various projects including the flight control systems for the B-1. Mel retired in 1979. His wife, Marge, passed away in 1996.

BLACKBURN, RAYMOND D., 82 – passed away on May 12, 2013 in Neosho, MO. He moved to California in 1962 and accepted a position as a computer programming specialist, receiving many awards for his contributions to the Apollo, Shuttle and Space Station projects. He retired in 1989 and moved to Neosho, MO. His wife, Sarah, passed in 2010.

CAMPBELL, MARK E., 93 – passed away peacefully in his sleep on May 9, 2013 of cancer. After earning a B.A. and M.S. degree in engineering from MIT, he joined NAA as an aerospace scientist from 1951 to 1990 before retiring. He was preceded in death by his loving wife, Nell.

CIOTTA, ANTHONY F. "TONY", 92 – passed away peacefully in Costa Mesa, CA on February 7, 2013. Tony joined NAA in 1948 at the Torrance Facility. He retired from Space Division as Manager of the Manufacturing Engineering Department in 1980. Tony lost his loving wife of 57 years, Doreen, in 1998.

COLE, GARY, 74 – passed away quietly on May 12, 2013. After serving in the Army, Gary joined the Space Division, serving 28 years and rising to the position of Director of Labor Relations and Security. Gary is survived by his wife of 30 years, Barbara.

COTHRAN, WOODROW W. "WOODY", 88 – of Whittier, CA passed away on December 2, 2012. After returning from the war in the Pacific, he started at LAD in the drop-hammer shop and advanced on the X-15, Apollo and Shuttle programs. Woody retired from the Planning Department at Space Division in 1983 with 37 years of service. He died of a broken heart when his wife of 70 years, Lillian, died in April 2012.

FJELSTED, ARDEN G., 92 – a long time resident of Lancaster, CA, Arden died on March 15, 2013 surrounded by his family. His career with NAA was interrupted by WWII service with the 35th Infantry in the South Pacific. Upon his return, he was transferred to flight test operations at Edwards Air Force Base on the F-86, T-39, X-15, B-70 and B-1 aircraft. Agnes, his soul mate for 64 years, survives him.

GEISERT, LEONARD E. – died on May 8, 2013 in Dubuque, IA. As an aeronautical engineer, he designed parts of the Apollo Command Module and storage units for the Space Shuttle. Leonard retired from Space Division in 1980 with 39 years of service.

GIBBS, PAUL L., SR., 90 – passed away peacefully at home in Norwalk, CA on March 3, 2013. As an Experimental Lab technician, Paul had several patents and awards for the work he performed on the Apollo and Shuttle programs. He retired in 1985 with 33 years of service.

HULL, JAMES A., 89 – of Corona, CA, left this earthly soil on May 12, 2013. After retiring from the U.S. Navy in 1962 as a Chief Warrant Officer with 20 years of service, he, subsequently, retired again from the Marine Systems Division as a Senior Research Engineer. He was preceded in death by his wife of 69 years, Josephine.

KEITH, MARTHA, 86 – of Carefree, AZ, passed away on December 13, 2012 after a long battle with lung cancer. Martha served for many years at Space Division along with her husband Blaine.

MORFORD, ROBERT W., 76 – a kind and gentle man, Robert passed away on March 4, 2013 in his Placentia, CA home surrounded by his family. With a degree in electrical engineering from CSULB, he worked for more than 40 years before retiring. He is survived by his caring wife of 27 years, Rhonda.

OSIMO, MARIO C., 92 – Mario died on March 24, 2013 at home in Huntington Beach, CA. Following service in the U.S. Marine Corps he joined NAA, where the skills he learned in the Corps served him well on the Apollo, GPS, and B-1 projects. He retired in 1996 with 25 years of service. He was preceded in death by his first wife, Kathryn and then remarried in 1996 to Ann Woolslayer.

PARSONS, THOMAS R., 87 – died on April 6, 2013 at home in Rolling Hills Estates, CA. After receiving his M.S. Aero Engineering degree from MIT, Tom joined the LAD Aerodynamics Group in 1957. He was appointed Manager of Advanced Programs in 1972 and promoted to Director of Advanced Plans and Resources in 1979. Tom retired in 1988 with 35 years of service. He is survived by his loving wife, Marion.

RIDGEWAY, CHARLES H. – passed away on May 16, 2013 after a lengthy battle with cancer. Charles retired from NAA/RI in 1996 with 35 years of service as an Accounting Manager and continued serving for 12 more years in a consultant capacity. He is survived by his wife of 51 years, Betty.

SARGENT, TRUDY K., 58 – Trudy died peacefully on February 25, 2013 after an 11-year battle with ovarian cancer. A graduate of CSUF, she joined NAA/RI as a department planner in 1980 and continued her employment until approximately 2005 when she went out on medical leave due to complications with the cancer.

ST. DENIS, JOSEPH "JOE", 80 – passed away at home in Oceanside, CA on May 22, 2013 of respiratory failure. Joe served as a project engineer for Ground Service Equipment (GSE) on the Apollo and Space Shuttle programs. He retired in 1997 with 38 years of service. He is survived by his loving wife of 38 years, Faith. She is also a retiree of NAA.

LOST SHEEP, BULLETIN RETURNED WITH NO FORWARDING ADDRESS

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JAMES E. DRISKELL – DUNLAP, IL

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KENNETH L. PIERCE – YUMA, AZ

JIMMY L. SCHMIDT – THOUSAND OAKS, CA

JACK L. SMITH – COEUR D'ALENE, ID



PAX DOMINI SIT SEMPER VOBISCUM

"Every day I remind myself that my inner and outer life are based on the labors of other men, living and dead, and that I must exert myself in order to give in the same measure as I have received and am still receiving."

— Albert Einstein

NORTH AMERICAN AVIATION
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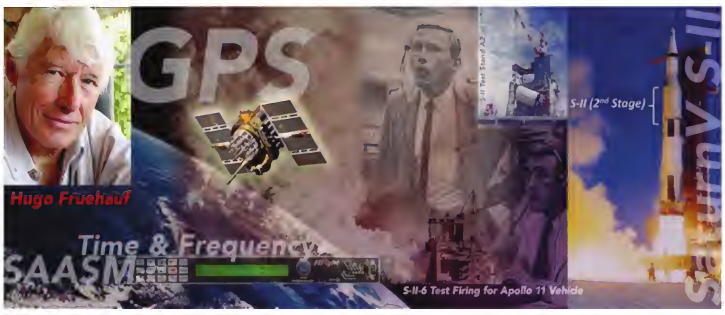
Mr Hugo Fruehauf

with our sincere thanks for presenting

"A short history of GPS, satellite design considerations, commercial and military coexistence, and the role of atomic clocks in the GPS infrastructure"

to the faculty of the United States Air Force Academy, Colorado Springs, Colorado, 9 May 2013

with special thanks for the support of the Retirees of North American Aviation, Inc.



NORTH AMERICAN AVIATION
Retirees Bulletin
"Where The Best Never Rest"

Fall 2013

Inside:

ROCKETDYNE FACILITY OVERVIEW by Cleve Kimmel
DEVELOPMENT OF THE REDHEAD/ROADRUNNER by Erwin Ulbrich, Jr.
APOLLO 14 – A CASE OF TRUE GRIT by Larry Korb
NAA MEMORIAL BENCH DEDICATION by Billie McComas Bower



Photo Courtesy of James Shaw

Among guests and those participating in the North American Aviation Memorial Bench Dedication at the National Museum of the United States Air Force in Dayton, Ohio on August 15th were (left to right) Nolan Leatherman, NAA Master of Ceremony; Col. Steven Teske, USAF (Ret), Boeing Director of Dayton Operations; Howard Chambers, NAA Speaker and Presenter; Lt. Gen. John L. Hudson, USAF (Ret), Museum Director; Col. Mona Vollmer, USAF (Ret), Director of Funds Development for the Museum Foundation; Father Michael Kreutzer, Chaplain; and Capt. James Shaw, U.S. Navy (Ret), NAA Bench Committee.

NORTH AMERICAN AVIATION
Retirees Bulletin

North American Aviation Retirees Bulletin, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAA Retirees Bulletin can be contacted at The Boeing Company, Seal Beach facility by phone at (562) 797-3836. Send mail to:

North American Aviation Retirees Bulletin
P. O. Box 3797
Seal Beach, CA 90740

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Dear NAA Retirees Bulletin Subscriber

A week before I was planning to fly to Dayton, my cardiologist recommended that I stay home. So the North American Aviation Memorial Bench Dedication was entirely organized by Nolan Leatherman and Jim Shaw of the Columbus Division and Jane Leach, the Events Coordinator from the Museum. Howard Chambers flew out to represent NAA and gave a short but incisive history of North American Aviation to an audience of 150 retirees, families and friends. It was a fantastic program that brought nothing but praise from all who attended.

We have received a letter of acceptance from Captain Ellis of the Naval Aviation Museum in Pensacola accepting our North American Aviation Memorial Bench so we have ordered the bench. It will be identical to the one at Wright-Patterson with only the list of aircraft and projects changed in accordance with those delivered to the U.S. Navy. Since both benches are identical, the monument company will absorb all costs associated with crating and shipping the bench to Pensacola.

The total donations to date are $12,561.51. Part of these funds came from a group of retirees from the Columbus facility, including retirees from Curtiss Wright. These were funds used for their annual picnic. Age and time has caught up to them and there weren't enough folks left for another picnic so they generously sent the left over money for the benches. The bench fund now has more than enough to cover the costs of both benches, delivered and installed.

In this issue we present four authors. Two are very familiar to our readers and two are joining us for the first time. Our Science Editor, Larry Korb, discusses the Apollo 14 Mission, a venture that took a lot of courage to complete and the three astronauts that risked their lives far beyond the call of duty to do it. Another prolific writer, Cleve Kimmel, takes us on a guided tour of the Rocketdyne facility when it was operating at its Best!

From the NAA Columbus facility, we have Billie McCamus Bower reporting on the Memorial Bench Dedication at the USAF Museum. Her mother and daughter accompanied her to the ceremony—three generations that worked at Columbus.

To provide the best and most complete history of North American Aviation, Inc. the Bulletin is always searching for the lesser-known NAA programs that were conducted at any and all sites. Erwin Ulbrich, also from the Columbus Division, provided us with the Development of the Redhead/Roadrunner Missile article.

As if her health issues weren't enough worries, our Sonnie Robertson was in a very serious car accident. It has been over a year since she became ill and we all on the Bulletin miss her. Please include Sonnie in your prayers.

>>> NEW LOCATION – PLEASE NOTE! <<<

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Rocketdyne Facility Overview

A Summary Recap by Cleve Kimmel

North American Aviation leased the Santa Susanna Hill Area, originally called the "Dundas Property", from 1947-1954. In 1954, NAA purchased Parcel A and the Silverdale Properties. These became Test Areas I, II, III and IV. Intermingling of usage and responsibilities interchanged until 1976 when GSA transferred all management responsibilities to NASA, and NAA-Rocketdyne became the site caregiver. The separate Division of Rocketdyne was formed in 1955; along with the creation of Atomics International, Autonetics, Missile Development, Fresno and the LA Divisions as separate corporate-divisional entities. The successful acquisition of the Saturn/Apollo Project management contract assisted greatly in the expansion and growth of Rocketdyne.

APOLLO/SATURN LAUNCH VEHICLE ENGINES

Portions of the article were extracted from NAA/NASA files.

Apollo F-1 First Stage Engines

During the time that the Apollo configuration was being created, Rocketdyne had the engine contract for the first stage engines. Ron Huber, a member of the LA Systems Design Group, transferred to Rocketdyne in the early 1960s. He was assigned to a quality assurance department that was responsible for verifying that the site installation valving systems were conforming to their particular fluids and environments. He discovered that the majority of valves used for the various gases and propellants were previously procured from vendor catalogues, with little regard to material compatibility or the local environment. He went on a rampage, and RED TAGGED virtually all valves. Many were compatible with the specific fluid usage, but had no environmental protection – they were rusty. These he had nickel or chrome plated. Some others, used in cryogenic systems, he trashed, as they were basically cast iron – or worse. He was so upset with the procurement department that he took one of the valves and nailed it to the director's office wall – to remind him to stop buying this type of junk.

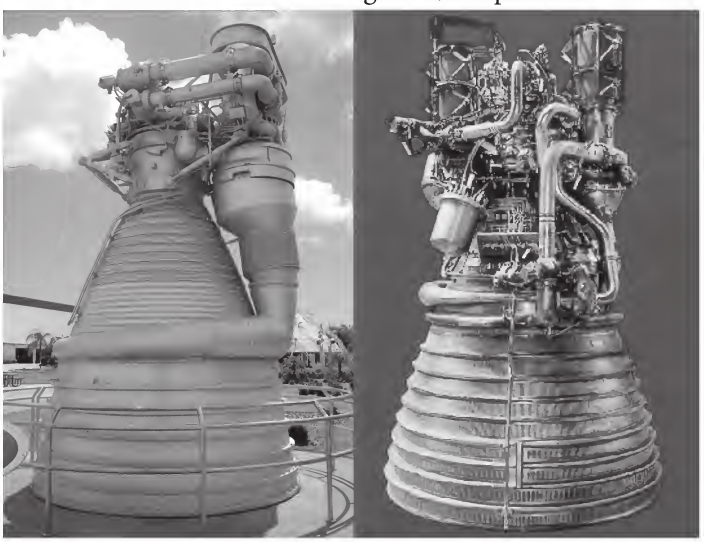
Things stabilized, and the final development programs for the F-1 engines went into high gear. These engines were designed to operate in the vertical position, so the thrust stands were created to accommodate that direction. Some test stands directed the exhaust sideways. Other test stands were created on Air Force properties.

The F-1 was originally developed by Rocketdyne to meet a 1955 U.S. Air Force requirement for a very large rocket engine. The Air Force halted development of the F-1 because of a defined lack of a need for such a large engine. However, the newly formed NASA organization contracted Rocketdyne to complete its development. Test firings of F-1 components had started in 1957; and the first static firing of a full stage F-1 was performed in March 1959. Seven years of developmental F-1 tests revealed serious combustion instability problems, which sometimes resulted in failure. The problem was intermittent and unpredictable. Eventually, engineers developed a technique to determine exactly how the operating chamber responded to variations in pressure and they established methods to eliminate those oscillations. The engineers then experimented with different co-axial fuel injector designs to obtain the one most resistant to instability. These problems were analyzed from 1959 through 1961. Eventually, the engine's combustion was so stable it would self-correct artificially induced instability within 1/10 of a second. The F-1 thrust and efficiency was improved several times during the Apollo/Saturn Program to meet the increasing demands of later missions. There were small variations between engine configurations assigned to a specific mission, plus variations in average thrust between those missions.

Each engine weighed between 18,000 - 20,000 pounds before launch. They were 12.2 feet in diameter and 18.5 feet tall. The engine burned a mixture of Liquid Oxygen and Rocket Propellant Fuel, producing over 1,500,000 pounds of thrust (lbf), depending upon the configuration. Five were used for the Saturn V first stage.

Apollo J-2 Second and Upper Stage Engines

J-2 development started in the late 1950s after NASA expressed an interest in using liquid hydrogen-fueled engines that produced a ground test thrust up to 149,000 lbf. After the Saturn support structure was being considered as a launch vehicle for the Apollo Mission to reach the moon, a source evaluation board nominated Rocketdyne to develop a "high-energy rocket engine, fuelled by liquid oxygen and hydrogen, to be known as the J-2". The actual development contract was awarded in September 1960. It required that the design "insure maximum safety for manned flight." Rocketdyne initiated development of the J-2 starting with an analytical computer model to simulate engine operations and establish design configurations. The first prototype engine test run took place in October 1962. In addition to flight hardware, five engine simulators were also used during the development process, assisting in the design of the engine's electrical and mechanical systems. The production contract required 155 J-2 engines to be produced for support to the final designs of the Saturn, and was assigned as follows per vehicle: 5 engines for each second stage of the Saturn V, and 1 engine for each S-IVB (Saturn IB second stage and Saturn V third stage). The engine for the third stage was fired twice during each mission; and after moon-mission completion, the third stage was expected to be ejected and aimed towards the sun. The J-2 operated on Liquid Oxygen and Liquid Hydrogen. It had a vacuum thrust of 232,250 lbf, and was 11.1 feet long and had a diameter of 6.8 feet. It weighed 3,942 pounds.



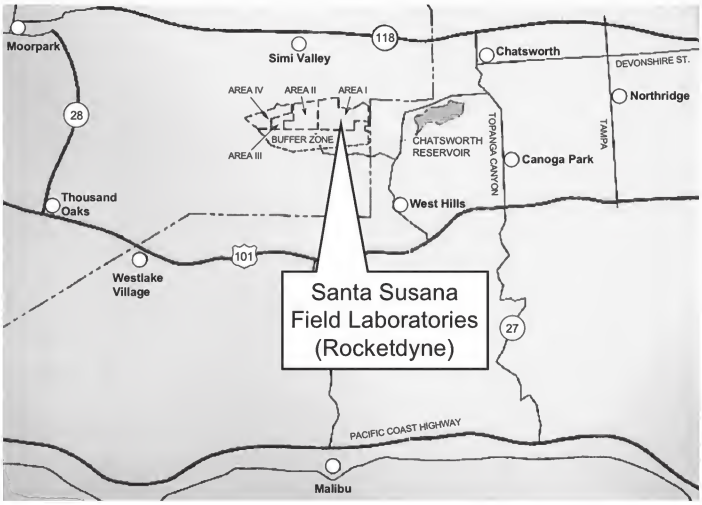
NASA/NAA Photo

F-1 Engine Display (left) and J-2 Engine (right)

CREATION OF ROCKETDYNE

In 1947 NAA fired its first rocket engine in the company parking lot. NAA had moved to Los Angeles in 1936, and settled on land south of where the Los Angeles Airport would later be located. They also selected acreage in the remote Santa Susana Mountains near Canoga Park for a permanent test site suitable to test a broad range of liquid-fueled propulsion systems. The site selection was made primarily because of its mountain top isolation and its many natural rocky bowl shaped land depressions. The first test stands erected were patterned after the German WWII test facilities at Peenemünde. They were designed to test separate engine components or complete engines. In November 1949, the first 3,000-lbf test was conducted on a pressure-fed injector, with a solid wall thrust chamber engine built from the old parking lot test facility hardware used at the LAD facility. By the Spring of 1949, testing of sub-scale injectors and full-scale gas generators was ongoing for major components of a 56,000-lbf engine. On 15 November 1950, the first successful main stage test of an American designed-and-built large liquid propellant rocket engine (XLR43-NA-1) occurred. From the XLR43-NA-1, the Redstone Engine was born, and expansion of the test facilities at the Santa Susana Field Laboratory would soon follow. In 1950, the Large Motor Test Stand in the Bowl Area, later named Vertical Test Stand #1, was the ignition test of the first version of the Navaho engine. In March of that year, the first full thrust test of a pressurized Navaho rocket engine was conducted.

The initial test facility was enlarged as NAA expanded further back into the mountainous Santa Susana terrain. In the early 1950s, they developed the first liquid oxygen-kerosene fueled engine. In 1954, this new bi-propellant technology would be put to use in the development of the engines for Atlas, Jupiter, and Thor missile systems. By the late 1950s, the Santa Susana test facilities had expanded into four major test area groupings; consisting of 18 large static test stands rated at thrusts up to 1.5 million pounds, five component test laboratories with over 60 test positions, and an advanced propulsion test facility and the AREA IV Nuclear Facilities overseen by the The Atomic Energy Commission (AEC), known today as the Department of Energy (DOE). The entire Santa Susana Field Laboratory encompasses 2,558 acres, of which 451 acres were Government-owned. *All following photos provided from NAA historical files.*



Field Test Laboratories

The testing facility (called "The Hill") nurtured rocket engines for the Navaho, Atlas, Saturn, Thor, Delta, and the Space Shuttle Main engine. The Hill was the laboratory for developing American Rocketry, and one of our nation's foremost venues for access to Space. There are several test sites in the Bowl Area:

Alpha Site – Constructed in the 1950s for testing the Atlas and Thor RS-27 engines. Originally there were three test stands.



Alpha Site with Two Test Stands

Bravo Site – Located adjacent to the Alpha site, it was constructed for testing the F-1 engine's turbopumps. It was later modified for testing the RS-27 and Atlas turbopumps and the Vernier Engines.



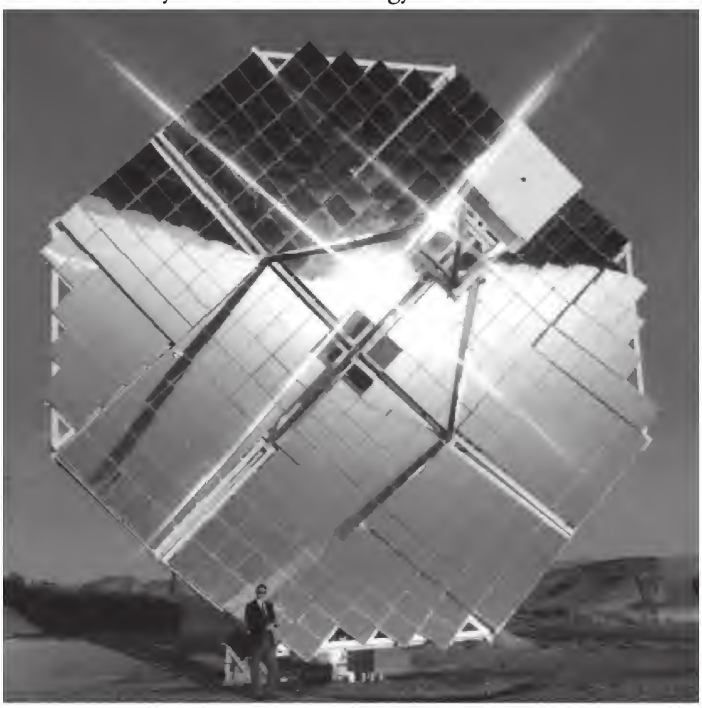
Bravo Site

Coco Site – Constructed to support the Apollo Program's Saturn second stage, it was redesigned to support the Space Shuttle Main Engine development and test.



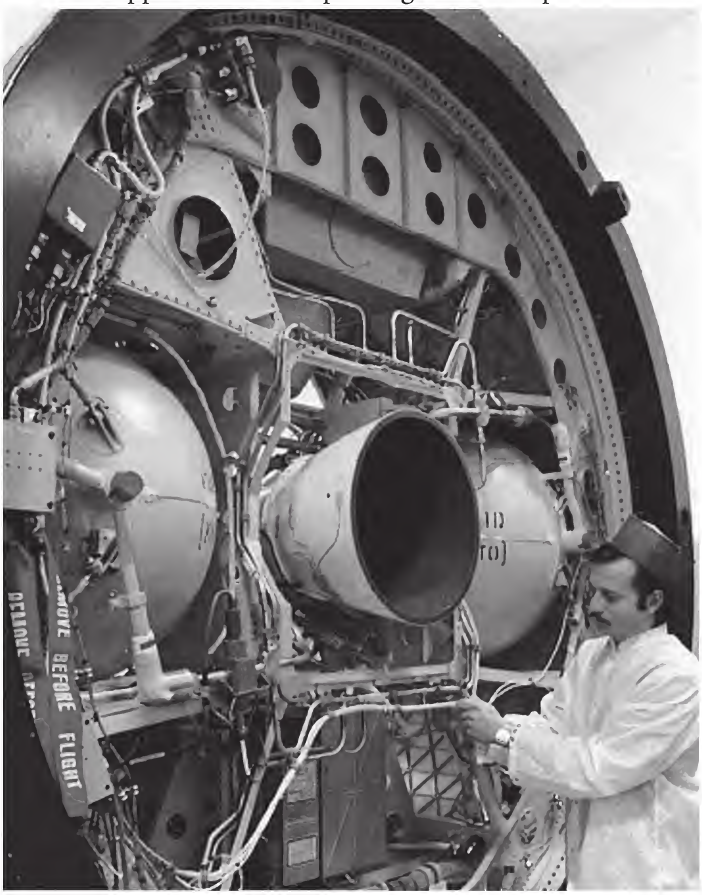
Coco Site

Solar Dynamic Test Site – Designed to establish technology that allows electrical power to be generated from solar energy using salt as the storage medium. This facility spearheaded America's entry into the solar energy field.



Solar Energy Site

Delta Site – Constructed to support the Thor engine testing, then modified for the Lance and J-2 Engines. It is well secluded, and also supported Peacekeeper Stage IV development tests.



Delta Site Peacekeeper Test

Additional test facilities were: Space Technology Laboratory IV, Advanced Propulsion Testing Facility, Component Testing Facility, Laser Engineering Technology Facility and the Energy Technology Engineering Center (ETEC). ETEC was an independent government laboratory, owned by the DOE, and operated by NAA after 1966. Prior to that time, Atomics International used the facility to develop the SNAP Reactor Program for the Air Force. Later this site was used to develop the Fast Breeder Reactor components. AI developed a reactor that was sold for $55,000 in late 1960s. It generated N-rays and Gamma rays for medical research.



ETEC (SNAP) Facility

Downsizing was initiated shortly after Rockwell Standard merged with NAA; it quickly gained operational control over the former aerospace giant. Starting in earnest in the 1980s, Rockwell shed several parts of the former NAA-Rockwell corporate entities. NAA and Rocketdyne were sold to Boeing in 1996. Rocketdyne became part of Boeing's Defense Division. In February 2005, Boeing resold what was then referred to as "Rocketdyne Propulsion & Power" to Pratt & Whitney. (Some material extracted from NAA-Rocketdyne's *"The Hill Brochure"*, dated October 1987.)

About the Author: Our readers are fully aware of the enormous capabilities of our author to comprehend complex matters and then explain them in language we can all understand. When combined with the fact that these events transpired over fifty years ago, it is truly amazing.

"In my many years I have come to the conclusion that one useless lawyer is a shame, two is a law firm, and three or more is a Congress."

— John Adams

Development of the Redhead/Roadrunner Missile

by Erwin A. Ulbrich, Jr.

Introduction

During World War II, the introduction of radar and solid rockets allowed the development of the first generation of anti-aircraft missiles. Typical of these were the Nike missiles positioned around Los Angeles at the end of the War. In the 1950s, a new generation of jet fighters and bombers were developed, and it was obvious that a better anti-aircraft missile was then required and a typical one in the U.S. was the MIM-23 Hawk missile. It was to engage, both subsonic to supersonic threats, from ground level to 65,000 feet altitude. Missile crews for the Hawk were trained at Ft. Bliss in El Paso, Texas, at the McGregor Range, and at nearby White Sands Missile Range (WSMR) in New Mexico which could be used for flight testing missiles. Collectively, the three bases provided a very large expansion for the live fire of rockets and missiles for the U.S. Army.

The Columbus Division of North American Aviation (NAA) won a contract in 1959 to build a target drone for the Hawk missile crews that had to be economical and reusable. When it was operating near the ground, it was to be capable of flight 300 feet above the ground at 0.9 Mach and it was then called the *Roadrunner*. When it operating in the stratosphere, it was capable of flight at Mach 2+ up to 65,000 feet altitude and it was then called the *Redhead*. Both versions were to have the same analog flight control system with a switch for setting various gains and constants.

Requirement

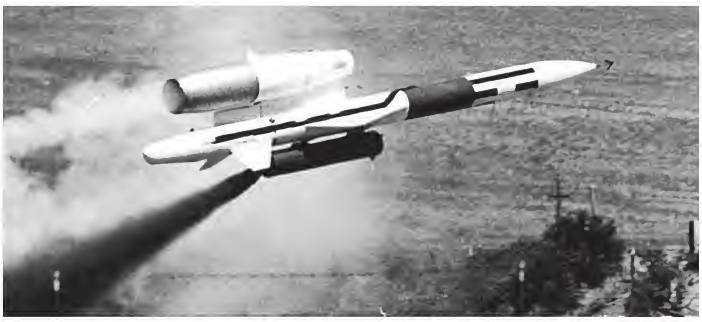
The missile was mounted on a Little John launcher with the booster rocket developed from the artillery rocket's booster. It was capable of a "Zero" launch where it had to become operational directly from the launch. There were only two aerodynamic surfaces; elevons controlling both pitch and roll and indirectly yaw. They had no authority at rest and one to two seconds after the booster was fired, the airspeed was sufficient for them to start controlling. That meant that for those two seconds, the booster thrust had to be closely aligned to the center of gravity (CG) of the missile/booster because the booster generated 5,000 pounds of thrust and the missile only weighed 880 pounds. If there was a misalignment, there would be a very large rotational torque in pitch or roll or both which could not be controlled. After the two seconds, the flight control would start to balance the two elements. At about four seconds, the amount of air and fuel going through the ramjet would ignite, providing thrust. At about five seconds, the booster would burn out and aerodynamic drag would strip it off the missile. The CG will then move and the elevons, using full authority, would rebalance the forces. Normally, a vertical transient of about 5 g was encountered.

Design

The missile can be seen to have a radome on both ends. Inside each is a Luneberg Lens which provides a strong radar return to the missile battery radar. In the forward radome is a pitot system which provides barometric static pressure and total pressure and also launch point static pressure. This system was designed by Rosemount and featured a compensated static port on the boom not the fuselage as in most aircraft.

The aft radome would be blown off the missile, releasing a braking rocket and a parachute for recovery when desired or when





the ramjet fuel was gone. Behind the radome in the front was the avionics bay which held the autopilot and the command radio receiver, the vertical gyro and the rate gyros. A short whip antenna protruded out the top of the bay, and it picked up the guidance commands which came from a transmitter in the Command and Control Center where the missile pilot was located.

In front of the rear radome was a bay containing the missile battery and the accumulator/pump/actuator package. It could be set for various gains and damping in the auto pilot. The two bays were connected by a wiring tunnel. This is the black strip shown in the picture above which was taken about two seconds after launch. The black smoke is from the booster. The white smoke is from an igniter in the engine that has not yet started the engine fuel burning. The elevons are about to pitch the missile up. On the pitot boom is an angle of attack sensor which was only used for flight test telemetry.

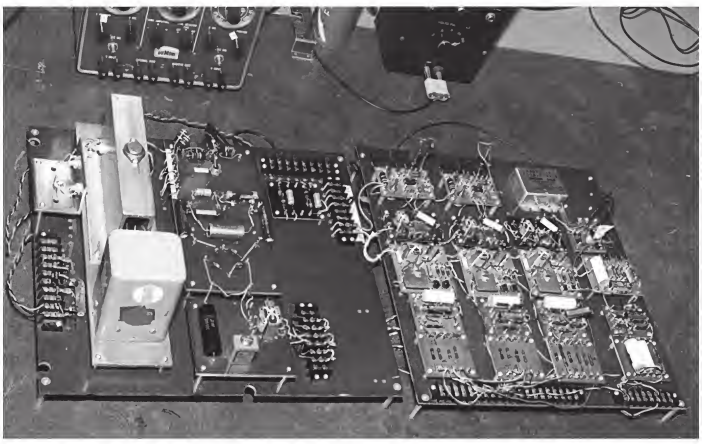
When the engine ignited and the booster was gone, the missile flew more or less at a small pitch angle. It can be seen that the missile was statically unstable, that is, there was more mass (the engine) above than below. This meant that the flight control system had to function for it to fly or it would turn over. During flight test, it was determined that the missile made outside turns unlike a conventional airplane. This did not affect its use as a target but it would be uncomfortable for a passenger. The vertical gyro design was borrowed from the V-1 missile although it was made by the Iron Fireman Company in the U.S. It was air-erected and it had stops on its motion. If it hit a stop during its operation, the gyro would tumble and it would crash the missile. This was used by Spitfire pilots during the war to crash the V-1s. It did not affect the missile's use as a target.

The autopilot controlled the missile in pitch, roll, and altitude. The missile speed was set by the engine fuel controls which were in the engine pylon. The engine at rest looked like a titanium garbage can and it is hard to imagine it operating like a supersonic blowtorch. It did supply significant sonic vibration to the missile in flight. The ramjet was supplied by Marquardt in Pomona and was designated as MA-74.

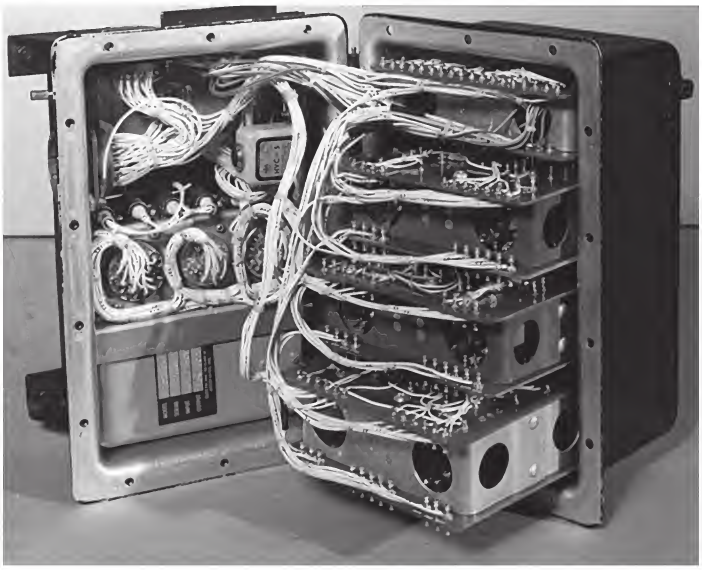
At the Command and Control Center, the missile was tracked by a radar receiver which produced the ground track of the missile in flight. Hooked up to this was a 3D model of the terrain which could produce a differential altitude signal for the range above or below the launch point. This could be sent to the missile to profile its flight over the terrain. The autopilot could also be set for hold pitch or hold altitude or both remotely from the Command and Control Center. There was a very tight specification for this profiling of 300 feet altitude plus or minus 60 feet. A particular piece of terrain known as Hummingbird Gap between two mountains was given as an early flight test objective. It would be impressive to see the missile come roaring out of this gap.

All systems on the missile were analog in nature. The 28 volt battery voltage was regulated down to 24 volts DC using a constant voltage circuit. The four operational amplifiers in the autopilot were driven by double-ended 24 volts AC from a 400 Hz inverter. Their functions included: the Starboard Elevon Valve Driver, the Port Elevon Valve Driver, the Pitch Summing Amplifier and the Roll Summing Amplifier.

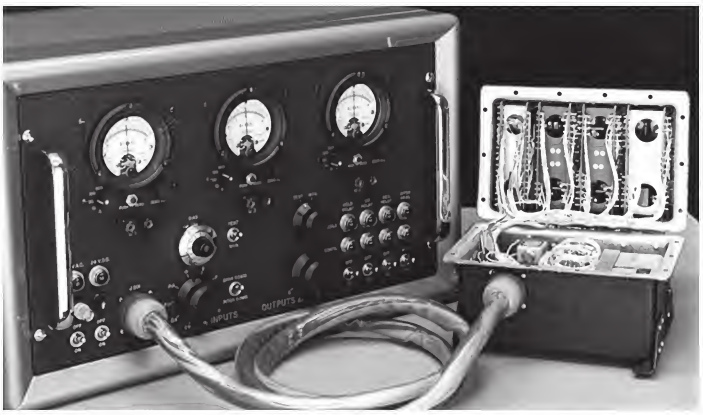
Shown is the breadboard for the autopilot. Individual transistors, which were invented about five years earlier, were used throughout.



The actual autopilot was developed a few months later. This was entirely a Columbus Division product. Two principal criteria were low cost and sturdiness because of the engine vibration. These were met using a deep drawn aluminum box that cost $12. It was modified with beryllium coated spring clips to hold the four operational amplifiers. This box and contents were thoroughly tested over a wide frequency range in all axes. All internal electrical joints were hard-wired. Life testing was not extensive as the total life of the autopilot was thought to be a few hours.



There were only two connectors on the autopilot; one for the flight control system and one for test which was also used in flight for connection to the radio for Command and Control. The system required a system tester and this was also a Columbus Division product where the first article was designed and produced in three days. A careful inspection will show that the toggle switches are upside down. I took a lot of ribbing over that.



The autopilot also contained a pitch programmer which provided a climb out signal for the missile when it was fired. This was a durable spring wound timer which was built by a vendor in Riverside, Illinois. When I went to inspect their factory, I was surprised to see that the employees worked in the dark over a bowling alley. The management told me that they were specially trained people who were hearing and vision impaired. The timers always worked fine. A hallmark of this effort was the use of an analog simulation of the missile flight including as much hardware as possible. One instance was the actuators. As soon as the actuators were done, they were integrated into a simulation rig. Another was the vertical gyro which flew in a large three axis Carco table.

At the end of the design effort, every autopilot that was made was flown on the analog simulation to assure records of what flight test should be like and then it was put in a sealed box (by Quality Control) and taken from Columbus to El Paso in a shipping container which was painted day-glow red so that the courier could keep track of it in baggage handling.

Flight Test

Fight test at WSMR started before any hardware was ready and consisted of using the booster which was manufactured by Rocketdyne in Texas to loft wooden poles which had similar inertial characteristics to what the missile would have. At the end of three firings, very little data was acquired and all of the poles crashed into the ground. It did show the important role that the flight control system would play during launch. Both engineering and flight test did the testing and since there was no place for civilians to stay at WSMR, the Columbus staff stayed in El Paso, and early each day drove 90 miles on a private road at 90 mph with the headlights on to WSMR. This was reversed in the evening. Several cars were worn out during this test program. When the first sets of hardware were ready, it was time for the actual missile flights. The first three of these were a repeat of the earlier tests and at the end of three flights there were only about 10 seconds of data. The crashes were powerful and devastating.

The Customer and NAA Management realized that something drastic had to be done. The obvious problem was booster misalignment and the solution was given to both Flight Test and to Engineering. I was given the job of "Keeper of the CG" and working with the Weights Group, we came up with our best estimate of the CG location. This work was hindered by WSMR safety regulations which required that the missile without fuel and the booster be measured separately and then the fuel weight had to be added analytically to the measured date to provide an estimate. The big question was how many air pockets were in the fuel tank behind anti-slosh baffles, etc. We at least could control the amount of fuel put in. These safety provisions were reasonable if we should ever drop the missile and it went off.

The other group was the Flight Test engineers and they made the most important invention to help solve the problem. They built a conical gage that fit into the booster nozzle with a long rod aligned with the thrust vector. They then used land surveyor's tools from a distance to adjust the interface between the missile and the booster to align the thrust vector with our calculated CG. As it came out, the missile symmetry put the CG more or less on a vertical plane in the center of the missile. The nozzle could be adjusted to be in this plane also. That still left two dimensions to be accounted for.

When everything was done, there was a successful flight. When a turn was initiated we discovered the missile's tendencies to make outside turns. I did not witness this since there were only a few people allowed in the Command and Control Center during flights. The telemetry was clear however. This required a rework of the equations in the flight simulation so that they agreed and from then on there was a close correlation between the two. The simulation of the first 5 seconds of flight was accurate from the start which helped a lot. We also could use the simulation then to find the limits of CG location that we could live with. These limits were in the small fractions of an inch as I remember and different for lateral and longitudinal errors.

Missile Flight Program

When the engineering was done, I was given other assignments associated with lunar landing simulation which became important at Columbus since we were some years ahead in that area. The missile, after about a year of testing, went to McGregor Air Force Base for actual training use. In June of 1963, it was designated as the MQM-42, Redhead/Roadrunner. It was used for about 15 years into the 1970s. The missile, on paper, had a 250 mile range which seemed to be a lot but at Mach 2, it was only about a 10 minute flight. At Mach 0.9, it is longer but the friction is greater at low altitude. This meant that you would get only one engagement per launch. In use, the actual altitude ceiling was given as 59,000 feet. There were other drone competitors but none could beat the low cost of the ramjet versus a jet engine or a rocket engine. Subsequently, many other missiles used ramjets. I never got any data on how much reuse the missile could provide. It was obviously a problem to parachute it into a rock pile with the wind blowing, but other than that, many of the interchangeable parts would be durable enough for rework and reuse.

I never got to see the missile fly. In retrospect, this was one of the most fun jobs I ever had. Almost every day, you could go out and at least on the computer, you could shoot rockets.

About the Author: Erwin Ulbrich is a retired flight control engineer who worked for seven aircraft companies during a 45-year career, culminating in the design of the B-2A avionics system involving the integration of over 200 computers. In the 1990s, he taught at UCLA Extension on the integration of all of the modern avionic safety systems into the cockpit to help provide the great increase in aircraft safety that we now experience. He and his charming wife, Myrna, have lived in Whittier, California for 50 years where he changed the thrust vector to his employers but not his residence.

Apollo 14 – A Case of True Grit

by Larry Korb

Apollo 14 was the sixth Lunar Mission and the third to land men on the Moon. Its mission was to explore the elevated Fra Mauro formation and bring back geological minerals samples. The Cone Crater, located in this formation, was believed to be the oldest on the Moon. This was the same mission that was assigned to Apollo 13, but was never completed. The Commander was Alan Shepard, the Command Module Pilot was Stuart Roosa, and the Lunar Module Pilot was Edgar Mitchell. Alan Shepard, 47, was the oldest astronaut to enter space at that time and, for him, it was the culmination of a very difficult and troubled astronautic career. But to set the stage, let's visit the environment of the late 1950s and early 1960s.



NASA photo

The Crew of Apollo 14: (left to right) Stuart Roosa, Alan Shepard, and Edgar Mitchell.

Background

The Russians launched a satellite, Sputnik 1, on October 4, 1957, a 23-inch diameter aluminum ball weighing 184 pounds. America was caught completely off guard! This was followed by Sputnik 2 just 30 days later. Sputnik 2 weighed 1,119 pounds and was launched to celebrate the 40th Anniversary of the Bolshevik Revolution. It carried a live dog, Laika, a life support system fitted with a heart monitor, temperature sensors, etc. The Russians told the world that Communism was superior to Capitalism and that they were leaders in technology in the world. America's response was pitiful. On December 6, 1957, we tried to launch the Vanguard satellite, a 6-inch diameter, 3.25 pound satellite. The Vanguard rocket lost thrust 2 seconds after launch and lifted a mere 4 feet off the pad, before it fell back and exploded. It was labeled "Kaputnik" by the Press (after a German word Kaput, meaning failure). A second Vanguard launch on January 25, 1958 fizzled 14 seconds after launch. America was crushed, but on January 31, 1958, Wernher von Braun bailed us out with the launch of an Explorer 1 satellite, weighing 30.8 pounds. Our rejoicing was short-lived, for the Russians, about 100 days later, launched Sputnik 3, an extensive geophysical laboratory weighing 2,925 pounds. By October 1, 1958, NASA was created and 6 days later, Keith Glennan, the first NASA Administrator, approved the Mercury project.

Alan Shepard Flies into Space

Yuri Gagarin, the first human being to be launched into space, was a 27 year old Russian Cosmonaut. He was put into a full orbit of the Earth on April 12, 1961 in a spacecraft weighing over 10,000 pounds. Less than a month later, on May 3, 1961, Alan Shepard became the first American launched into space. The flight attained the altitude of 117 miles, a down-range distance of 303 miles, and a maximum speed of 5,134 miles per hour in its 15 minute and 23 second flight. Alan had about 5 minutes of weightlessness and endured slightly under 12 g during entry.

Shepard became an instant hero. Twenty two days later, President Kennedy addressed Congress; proposing that, *"Before the end of the decade America would land men on the Moon and return them safely to Earth."* Congress agreed and the Americans were euphoric. What most Americans did not know was that we could not have orbited an astronaut at that time because that would require an ICBM launch vehicle, such as the Atlas (which was not yet completely ready). The Russian launch required 40 times the energy of the Alan Shepard flight. The lunar launch would require 800 times as much energy as the Redstone launch of Alan Shepard.

You have to admire Alan for this daring, courageous flight. The Mercury had been launched 13 times up to that moment; 6 flights resulted in failure and 7 were successful. The Mercury had been launched with Little Joe Rockets, Atlas, and Redstone launch vehicles. Twice launch escape hardware failed. In the days preceding his launch, on March 18, April 25, and April 28, three different Mercury launches failed and the Mercury spacecrafts could not be recovered.

The Mercury Spacecraft weighed nearly 3,000 pounds and was bell-shaped, 10.8 feet tall and slightly less than 6 feet in diameter at its base. It was about the size of a telephone booth. (Modern Engineers probably cannot relate to this.) The astronauts called it the garbage can. It flew a "ballistic trajectory", meaning the astronaut could not "fly it", as they could with later vehicles such as the Gemini, Apollo, and Space Shuttle, which were built to proper lift/drag ratios. Air Force test pilots looked down on the astronauts, because they said astronauts didn't fly the spacecraft. They flew it just as much as the man in the front seat of a roller coaster "flies it". Even Ham, a 37-pound chimpanzee had taken the suborbital ride and returned safely. The Mercury, however, did have a launch escape system to save the astronaut if the booster encountered trouble.

The Mercury Spacecraft was pressurized with 100% oxygen and had a CO_2 scrubber. Shepard had the honor of flight testing the first astronaut flight suit. He soon realized its shortcomings, when a launch delay of 2+ hours could not accommodate his bladder and the suit did not have a relief tube or urine bag. (I'm sure when he entered zero gravity, the surface tension of the urine bathed him well.) The vehicle had 18 hydrogen peroxide thrusters: 6 each for controlling roll, pitch, and yaw. It was fitted on the aft end with three 400-pound and three 1,000-pound solid motor thrusters used to allow slowing for reentry, but these were not used in the suborbital flight. The vehicle had 3 parachutes: one drogue, one operational, and one a spare. The launch escape system was 25.9 feet long.

Mercury's convex base heat shield was composed of an aluminum honeycomb sandwich with multiple layers of fiberglass. The outer skin was made of René 41, a high temperature nickel alloy (>1,200°F).

Alan's Mercury Capsule, *Freedom 7*, was mounted on a Redstone rocket, a short range tactical missile with a range of 200 miles. It was a V-2 rocket on steroids. The V-2 weighed 26,000 pounds and was 46 feet tall. The Redstone used weighed 61,207 pounds and was 69.3 feet tall. Its fuel tanks were lengthened six feet for this mission. It used a Rocketdyne engine with 78,000 pounds of thrust, using propellants of liquid oxygen and alcohol and some hydrogen peroxide. (Compare that to the five 1.5 million pound thrust engines on the Saturn SI stage for the Apollo.) The Mercury had radio antennas and scanners for guidance and orientation with the Earth. The flight was a roaring success!

Alan Gets Grounded

Deke Slayton had scheduled Alan Shepard for the first Gemini flight. Preparations went well for 6 weeks when one day in 1965 Alan awoke feeling nauseated. He laid it out to Slayton, *"All of a sudden, Deke, I fell. I was so dizzy. The room was spinning around and suddenly I'm on the floor. I got up holding on to the wall, and right away, I got so sick, I vomited. I thought, 'Jesus, what the hell did I have to drink last night!' It must have been a hell of a hurrah, but well, that just wasn't the case."* Five days later, his head was spinning and it came back several times. He checked in with the flight surgeons and they said he had problems with his inner ear, a condition called Meniere's Syndrome. Fluid pressure builds up in the inner ear. The doctor said, *"There is no known operation for this condition."* He was grounded, vainly hoping somehow his condition would change, and he took medication to relieve the problem. *"I want to fly so damned bad. And, if this keeps the door open—Yep, I'll do that"*, Alan said.

An Operation

More than a year before the Apollo 11 landing on the moon, Alan was going from bad to worse. By the summer of 1968, the hearing in his left ear decreased and his balance had degenerated. Alan fought off melancholy. Then he decided he would find someone who could cure him. Talking with astronaut Tom Stafford, he was told an MD in Los Angeles was pulling off cures that no other doctor could do. Dr. William House figured out a way to cure Meniere's Syndrome and Alan went to see him for the operation. Dr. House's approach was simple: put a shunt between the inner ear and the endolymphatic sac near the spinal column to drain the fluid off. *"I'm willing to try anything,"* Alan said. But he had to keep this a secret! Some 8 months later, his hearing fully returned and he regained his balance. Dr. House said, *"My friend, you're cured!"* Alan had the flight surgeons run him through tests bordering on the edge of brutality, and they said, *"House is correct. You are completely cured. You are fully qualified for space flight"*. Alan went ballistic!

Alan pressed to get on Apollo 13. This matter went up to NASA headquarters for final approval. Headquarters ruled against it. They said sending two neophyte astronauts to the Moon with Alan was too risky. The crew had a total of 16 minutes of in-space flight. But they agreed to continue Alan's training and set him up to command Apollo 14.

With the explosion on Apollo 13, there was internal NASA dissension about the future of the Apollo program. For a while, Alan was concerned that the program would be cancelled and he would never get Apollo 14 off the ground. A thorough review after the Apollo 13 fire resulted in safety changes to the Service Module and the program was continued. For example, an extra isolated supercritical oxygen tank was installed in case of failure of the other two. In addition, a spare battery of 400 amps was added which would supply enough electricity to handle all the spacecraft needs.

The Apollo 14 Mission

As Alan made his way to the elevator to take him up to the capsule, he leaned his head backwards to take in the sight of the Saturn Launching Stack. It was overwhelming. He thought back on his first Redstone flight ten years earlier. He mused that even the Launch Escape Rocket on the Apollo had twice the thrust of his Redstone missile. The Saturn V was 5 times as tall as the Redstone and the S-IC first stage, alone, had nearly 100 times the thrust. He thought about the rocket being 10 inches shorter after refueling with the cryogenic fuels and oxidizers. Would that affect the Moon shot? There was a minor launch delay as a storm crossed over the pad, heading to the ocean.

The liftoff was spectacular to those watching it, yet rather smooth to the crew. However, the overpressure in the atmosphere due to the launch was recorded on instruments 1,100 miles away at Palisades Park in New Jersey. The 800-foot long fiery exhaust followed upwards. The S-II second stage fired on time and soon after, the launch escape tower was jettisoned. Then the S-IVB ignited and in 13 minutes they were in orbit of the Earth at 17,400 miles per hour and settled into a wonderful feeling of weightlessness. After nearly 2 full orbits, they were given the "GO" for trans-lunar injection, and the spacecraft sped smoothly to 24,500 miles per hour, the escape velocity of the Earth's gravitational field.



NASA photo

Apollo 14 begins its mission as it lifts off from Launch Complex 39A on January 31, 1971.

Docking Troubles

The next event was to blow open the adapter panels and use the Command Module to dock with the LM and start hook up to proceed to the Moon. Normally, this is an easy maneuver with no problems, but not this time. Stu Roosa aimed the probe perfectly into the center of the cone shaped drogue receptacle on the LM. Three metal probe latches, the size of a cigarette would lock inside of the drogue and inch the spacecraft close enough for 12 strong latches to lock it in place. A green light would confirm capture. No green light occurred and a second attempt to dock was made. Again, Stu Roosa was precisely on target; again no latching occurred. In Houston, they hauled out their probe and docking mechanism and it worked fine every time. If there is no latching, the mission would have to be aborted. Apparently, a small piece of grit was stopping the latching. A total of 5 attempts were made to no avail and excessive RCS fuel was being consumed. For the sixth attempt, CapCom suggested to dock at a faster speed and drive the probe as deeply in the drogue as possible, hoping to dislodge the foreign material. Alan said to Stu, *"Stu, forget about conserving fuel. This time just juice it!"* Both ships rocked from the impact. No rebound occurred and the green capture light went on. Had this not worked, Alan was prepared to do an EVA in a pressure suit to pull the vehicles together. If that failed, they were going to jury rig the two vehicles together as they had practiced it (with great difficulty) in the astronaut water training tank. One way or another, Alan was determined not to lose his chance to go to the Moon. Had they failed in a lunar landing, it could cause cancellation of the whole program and Alan would lose his chance to walk on the Moon. Luckily, this problem was put behind them and the mission continued.



NASA photo

Apollo 14 Command/Service Module* Kitty Hawk *photographed from the Lunar Module. The docking probe can be seen in its extended position at the top of the Command Module. Problems with the docking probe were attributed to grit in the docking mechanism.

Mission Abort Switch

As they approached the Moon, Roosa dropped the speed by 200 mph, putting them in an elliptical orbit with a low point 10 miles from the lunar surface. This would enable Shepard and Mitchell in the LM to conserve fuel. On the 12th orbit, the LM and Command Module were separated and they ran a checkout dress rehearsal of the LM descent to confirm it was working as planned. Bad news: the abort light came on, yet everything on the panel checked out as normal. They had a mere three-hour window to solve this problem or the mission would have to be aborted. Mission Control assembled their best brains and determined there was a short in the abort switch, perhaps a ball of solder or something. A telephone call was placed to Donald Eyles at MIT, the expert who programmed the LM computer. Houston NASA roused him out of a sound sleep and had an Air Force car drive him, pajamas and all, to his office at Draper Labs. He was to tell the computer to ignore the abort switch, however, when a real abort happened, the correct action would be taken. In 90 minutes he had rewritten the program and sent it to Houston for check out. It was perfect. Houston then forwarded it to the Apollo and Ed Mitchell entered sixty new sets of information in perfect order. He finished with 15 minutes to spare and they were "GO" for landing.

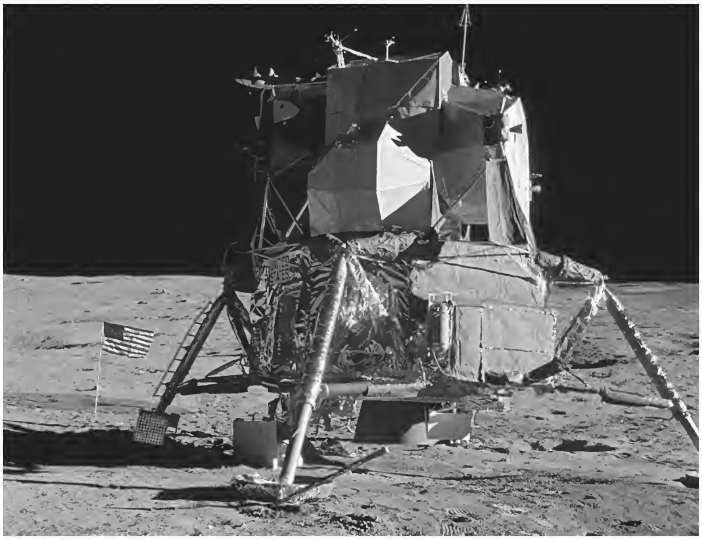
Radar Troubles

Shepard told the Mission Control, Houston, *"We're commencing the descent program."* Alan didn't ask the controllers, he told them. The LM descended with the backs of the astronauts to the surface and at about 13,000 feet, it would be flipped over and the LM astronauts could see the surface of the Moon. At 46,000 feet, they were still racing at 3,700 miles per hour. As they descended, the RCS thruster fired to steady the craft. However, whenever they fired, vibrations were felt through their hands and feet. The LM rocked fore and aft and side to side. Mitchell grinned at Alan and said, *"No more snake bites."* No sooner said, the snake was back and they lost the lunar surface radar that provided distances, and speeds. Again, they contacted Houston, reporting the problem. They were at 19,000 feet and belly up, unable to see the lunar surface. Houston advised, *"They could pitch over at 10,000 feet and have a longer look at the surface that way, but they can't land without radar. They'll burn too much fuel. If they go empty before touchdown, we'll lose them." "Roger, did you guys find anything?"* Shepard asked. Houston replied, *"No".*

Alan repeated the landing procedure. *"Okay, at 13,000 feet we pitch over."* CapCom said, *"We'll start the abort countdown at 14,000 feet."* Alan turned to Mitchell and said, *"The hell we will. If the radar doesn't kick in, we were going to turn her over and fly her down. Dammit, we both know we can do it! It could be worse. It is not pitch black down there and it's not an aircraft carrier plowing through the Atlantic."* He grinned and said, *"This is different. It's easier than taking forty-foot swells. I know we can bring it down!"*

At 14,200 feet, Houston said, *"Reset your circuit breakers. Turn them off, then on!"* Nothing happened immediately.

"You are now at 13,600 feet. It's time to abort," Houston said. Suddenly, Mitchell sees the radar come up on the screen and said, *"We've got radar lock".* Houston gave them the "GO" to land. At 10,200 feet, they pitched over and saw the lunar surface. They landed on flat ground only 60 feet from their target.



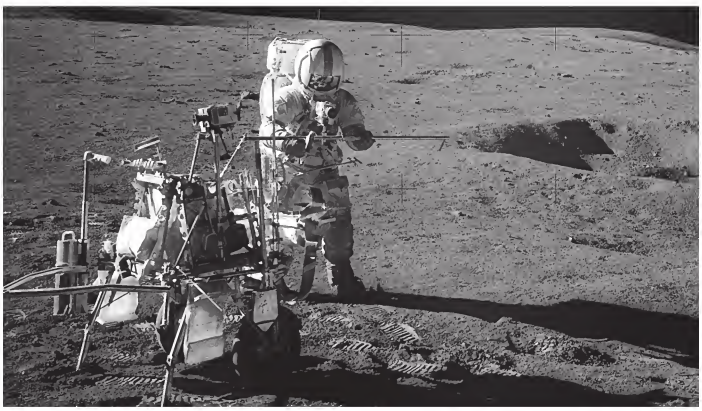
NASA photo

After problems with the Mission Abort Switch and Radar Altimeter, the Lunar Module* Antares *safely landed on the Moon in the Fra Mauro Highlands on February 5, 1971.

"Come on, Al", Mitchell said, *"Just between you and me, would you have really flown down without the radar?"* Alan grinned and said, *"You'll never know. You'll never know."*

Lunar Surface Activities

The prize they sought was Cone Crater, thought to have been formed 4 billion years ago. Rocks from the edge of the crater should show the composition of the Moon in its earliest existence. After bouncing on the surface and mystified at the fine regolith, which seemed like a powder magnetically attracted to their boots and space suits, they grabbed their Modularized Equipment Transporter (MET), which was nothing more than a lunar rickshaw. But it was easier than carrying rocks a long distance. The MET carried cameras, various tools, instruments, safety lines, maps and charts for navigating around boulders craters and gullies. In addition it carried core tubes for digging into the lunar soil, and an ALSEP—a package of sophisticated surface experiments. It also carried rocks they selected to take back to the Earth. During two lunar EVAs (a total of 9½ hours), they collected a total of 93 pounds of rocks which NASA, later proved, were more than 4 billion years old.

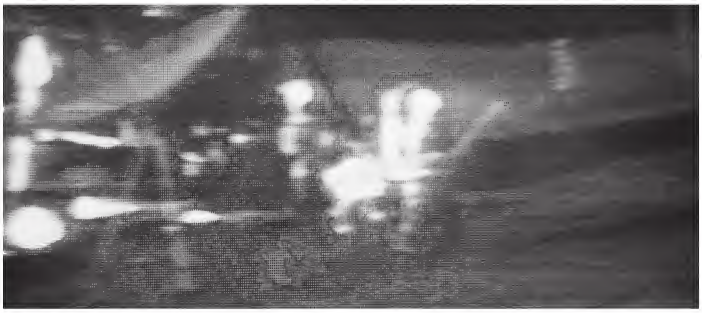


NASA photo

Apollo 14 Commander Alan Shepard with the Modularized Equipment Transporter, which the astronauts nicknamed the "rickshaw".

They learned much about the lunar surface: the clinging of the powdery regolith to their boots and uniforms, that "flat surfaces" are actually a series of undulating dunes which takes energy to navigate, and the fact that going uphill to the crater rim was too exhausting to complete, although they got within 75 feet of it. The rickshaw was a disappointment, for it was difficult to get it up the slopes and the wheel sank deeply in the regolith, making it hard to propel. (Apollo 15 would use an electric vehicle (Lunar Rover) to carry men and supplies on the surface.)

As a final gesture, Alan Shepard pulled out a jury-rigged golf club, a 6-iron. He put down a golf ball, but with the bulk of the suit he could not get both hands on the club. His one-handed shot sent the ball into a crater less than 100 feet away. Still determined, he plopped down another golf ball and hit it squarely, one-handed. *"There it goes! Miles and miles and miles",* Alan said. Well, golfers, like fishermen are prone to exaggerate. Some computed that it actually went between 200 and 400 yards.



NASA photo

Captured in a grainy video, Alan Shepard makes his famous golf swing.

Alan was unaware his golf distance record would be eclipsed, when the Russian cosmonaut, Mikhail Tyurin hit a golf ball off the porch of the International Space Station, traveling 17,400 miles per hour. Mikhail had trouble getting comfortable, he was tethered but had another cosmonaut hold his feet and he actually shanked the one-handed shot. The shot was paid for by a Canadian company, Element 21.

Finally the Apollo 14 crew blasted off the surface and docked with the Command Module. The docking occurred without a hitch. Then, saying goodbye to the LM ascent stage, they sent it crashing into the Moon for a seismic test. Their mission complete, they fired their main engine and returned home, enjoying three uneventful days. After reentry, they were picked up by the aircraft carrier *USS New Orleans.*

Epilogue

In the author's opinion, not only did Alan Shepard show true grit in his first suborbital launch, and in overcoming his problems to be reinstated as an astronaut, but also, the entire crew showed true grit as they fought successfully on three occasions to avoid aborting the mission (which may have cancelled the Apollo Program.) For all we know, the latching problem was also caused by true grit! This mission was another proud moment in the Apollo Program.

About the Author: What more can be said about our Science Editor that hasn't been said before? Larry's mind and memory are as sharp as they were 50 years ago. We are very proud to have him on our staff of volunteers!

The North American Aviation Memorial Bench Dedication

by Billie McComas Bower, NAA ID No. 44816

I attended the North American Aviation Memorial Bench Dedication at Wright-Patterson AFB to pay tribute to my first employer, North American Aviation, Inc. Fresh out of high school, I was hired as a "summer hire" on June 11, 1956 as a clerk-typist. Who would have thought at the time that I would be one of the last leaving the plant when it closed in the Fall of 1988. Most of my employment time was in Engineering and my jobs were diverse...clerk-typist to stenographer to secretary to staff administrator. When the plant closed. I was the incoming President of the NAA Columbus Management Club but my only action in that position was to put together a farewell video. From watching the A3J advance from a wooden mockup to the completed aircraft and then watching the last three RA-5C aircraft take-off so proudly to go to museums was an exciting and emotional experience!

It was so special to attend the NAA tribute that was long overdue and at the same time get reacquainted with many of my special friends and coworkers. I was quite impressed by the resolve shown by Nolan Leatherman in accomplishing this achievement. Apparently he visited the museum on many occasions and felt the frustration that there was no recognition of North American Aviation since the majority of aircraft on display were built by NAA. Finally, with the help and encouragement of the editor of the NAA Retirees Bulletin in California Ed Rusinek, he started a fund drive. Meeting with the Museum's administration and, with their approval, set about to establish a suitable memorial bench showing the NAA name and logo, the NAA Divisions and the basic nomenclature of the NAA built aircraft serving the Air Force. The results led to this dedication on August 15, 2013.

On stage, standing besides a very weathered NAA logo sign, in Carney Auditorium, Nolan conducted a very fitting ceremony for the dedication of the bench. The program consisted of the Honor Guard posting of the Colors and playing of the National Anthem; Invocation by the Chaplain, Father Michael Kreutzer; Comments by Howard Chambers representing NAA; Unveiling of the Bench by Capt. Jim Shaw, U.S. Navy (Ret); Presentation of the bench by Howard and Acceptance by the Museum Director, Lt. Gen. John Hudson, USAF (Ret). The program ended with the Benediction by Father Kreutzer, Retirement of the Colors by the Honor Guard and a beautiful rendition of "Taps" by a lone bugler.

Other dignitaries present were Col. Steven Teske, USAF (Ret), Director of Dayton Boeing Operations; Col. Mona Vollmer, USAF (Ret), Director of Funds Development for the Museum Foundation; Capt. James Shaw, U.S. Navy (Ret)/ NAA and Larry Morrison of Dodds Memorial in Xenia, OH, the makers of the Bench. Nolan expressed a very sincere and warm Thank You to Jane Leach, the Museum Coordinator for Special Events.

Closing on a personal note: My family at the Dedication represented three generations that served with North American Aviation, Inc.: My 93 year old Mother, Fran McComas, who started as "Rosie the Riveter" with Curtiss-Wright and stayed on with NAA for a total of 30 years; my daughter, Valerie Hamill, who served seven years before the plant closed and myself with 32 years of service. I close with a special thanks to Nolan Leatherman for such a grand celebration and tribute to the maker of the finest aircraft and spaceships!

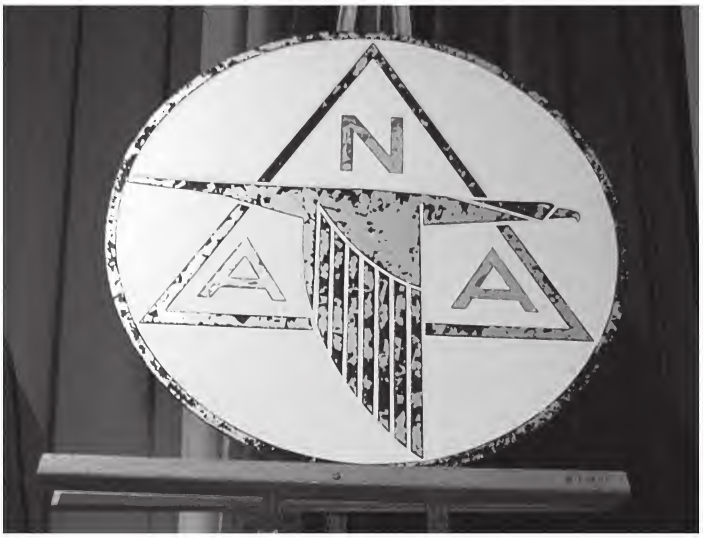


Photo courtesy of Billie McComas Bower

Weathered, but still a proud symbol—this NAA logo sign was displayed during the Dedication Ceremony of the North American Aviation Memorial Bench at the Museum of the United States Air Force.



Billie McComas Bower photo

Three Generations of Columbus Division workers are portrayed with Billie McComas Bower (right), her mother, Fran McComas (seated), and her daughter, Valerie Hamill (standing, left).



Photo courtesy of Billie McComas Bower



Photo courtesy of Jim Shaw via Denver Santee

Nolan Leatherman addresses the audience at the NAA Memorial Bench Dedication Ceremony.



Photo courtesy of Jim Shaw via Denver Santee

Howard Chambers comments about the significance of North American Aviation.



Photo courtesy of Jim Shawe

Capt. Ed Gillespie, former NAA Test Pilot, takes a quiet moment to stand in front of the NAA Memorial Bench.

Continued List of Donors for North American Aviation Memorial Benches

Name	City	Division Affilliation	Rememberance
Roger and Joyce Lawrence	Dolores, CO	S&ISD	In Loving Memory of Our Fathers, Clifford Lawrence and John Fleetwood
Harold J. Sinder	Westerville, OH	Columbus	
Isamu Miyashiro	Fountain Valley, CA	S&ISD	
Andrew Kendall	Gahanna, OH	Columbus	In Memory of Columbus Division Test Pilots George Hoskins, George Burdick, Jim Pearce, John Moore, Dick Wenzell, Don McCucker, Don Humphreys, and Bob Cockburn
John R. Andres	Seymour, TN	Columbus	
William F. Dean	North Tustin, CA	S&ISD	
Ennis & Linda Fairchild	Murrieta, CA	S&ISD	In Memory of Gary Cole, Director, Labor Relations and Security
Ruth Lucille O'Brien	Albuquerque, NM		In Loving Memory of My Husband, Wallace Lee O'Brien, LAD
Otto C. Juelich	Columbus, OH	Columbus	
John H. DeHart	West Chester, OH	Columbus	
John R. Scott Aircraft Workers Reunion Fund	Westerville, OH	Columbus	In Honor of all the Employees Responsible for the Great Aircraft and Spacecraft Designed and Built by North American Aviation. God Bless Them All.
Jack R. Potts	San Pedro, CA	S&ISD	
Edward Kearey	San Marcos, CA	GPS	In Honor of QA Engineer Roger Taylor, developer of the GPS Soldering Standards Manual
James M. Pierce	Placentia, CA	S&ISD	
David W. Herold	San Marcos, CA	Autonetics	
	Previous Total Donated	$10,655.00	
	Total Donated to Date	$12,561.51	

A Note of Gratitude and Appreciation

The Dedication of the North American Aviation Memorial Bench at the National Museum of the United States Air Force would not be complete without our own expression of gratitude and appreciation for all those that made this event possible. First, to all the Retirees of North American Aviation and their families and friends that so generously donated the funds that inspired us to go forward with this effort. Secondly, to Lt. General John L. Hudson, the Museum Director, and his Board of Managers for so kindly accepting our gift of the bench and its splendid location on the Museum grounds. Thirdly, to Jane Leach, the Museum Events Coordinator, for her outstanding effort in making the dedication, a very moving and tearful occasion for our retirees, a very memorable and happy event. Finally, to our very own, Howard Chambers, Jim Shaw and our NAA Columbus Family, God Bless You All!

— Nolan Leatherman, Bench Chairman

— Ed Rusinek, Bulletin Editor

John Sandford Inducted Into Canada's Aviation Hall of Fame

In a formal ceremony held at Canada's Aviation and Space Museum, on Rockliffe Airport, Ottawa on May 30, 2013, John W. Sandford of La Jolla, California received the medal from General Michael Hood, Deputy Commander Royal Canadian Air Force, as well as a certificate from Chairman Tom Appleton, recognizing him as a member of Canada's Aviation Hall of Fame.



"After starting his career in aviation with Avro Canada, John Sandford served in highest management positions with Stanley Aviation, Rockwell International, Fairchild-Republic, Gulfstream Aerospace and Rolls Royce. He is best known for launching the Dash 7 and the legendary Dash 8 aircraft while serving as president of de Havilland Canada."

— Induction citation, 2013

Contrails From The Past

by Ed Rusinek

Dear Mr. Rusinek,

Thank you for sending copies of the NAAR Bulletin to our family. We appreciate it indeed! We are very proud of our 2nd Lt. Evan Paul Rishel!

— Andy and Sherry Rishel, York, PA

Ed's Ans.: It is we who thank you for raising such a fine young man, scholarly, patriotic and ready to serve our country.

Dear Ed,

Thank you for the excellent job you and the staff are doing with the NAA Retirees Bulletin. The articles are excellent. We cannot wait to open the Bulletin the minute the postman drops it off.

— Jim and Linda Pierce, Placentia, CA

Ed's Ans.: The Bulletin has to be excellent because it represents the quality and standards of North American Aviation and the people that served there. All of the artists, professional writers, authors, astronauts, test pilots, engineers, and volunteers that have contributed to the Bulletin have done so freely and without expectation of anything more than a simple "Thank You!"

Dear Ed,

Enclosed is a check for $481.51 from the Aircraft Workers Reunion Fund as a donation for the NAA Memorial Bench to be placed at U.S. Naval Aviation Museum at Pensacola, Florida. This donation is "to Honor all the NAA Employees that were responsible for the Many Great Aircraft and Astro Programs that Emerged from the North American Aviation Organization".

Thank you for making the both the Air Force and Navy memorials a reality that is long overdue. Although my service with NAA was short-lived compared, it will be a proud moment in my life to attend the Dedication on August15th. My father served many years at NAA and I worked with many whose service dated back to the earliest days at the Columbus facility.

— John R. Scott, Westerville, OH

Ed's Ans.: Your donation has special meaning because it represented the remaining funds used to put on the annual reunion of folks from all the aircraft companies that were ever located at the Columbus facility. God Bless You All!

Dear Ed,

In reviewing the old issues of the NAA Retirees Bulletin, I noticed again the way this publication has changed in size, in format, in topics, in the way topics are submitted by so many different individuals. All of which keeps me waiting for the next issue to get to my mail box at the end of the driveway! I sure miss the people and the projects we worked on at the Space Division.

— Rosa Lee Herst, Burton, OH

Ed's Ans.: Thank you Rosa for your kind words regarding the changing quality of the Bulletin. In our 13th year of publication our "North American Aviation Family" of authors, artists, test pilots, division presidents, engineers, secretaries, photographers, combat pilots, historians, librarians, publishers has grown to over 150 individuals. What makes us unique is that all have given us their best efforts for nothing more than a grateful "thank you" and a "God Bless" from this old curmudgeon Editor.

Congratulations and Best Wishes to

David and Eileen Herold of San Marcos, California
celebrating their 66th Wedding Anniversary

Andrew and Barbara Kendall of Gahanna, Ohio
celebrating their 61st Wedding Anniversary

Eugene and Shirley Blum of Buena Park, California
celebrating their 60th Wedding Anniversary

Otto and Dorothy Juelich of Columbus, Ohio
celebrating their 60th Wedding Anniversary

Richard and Lucille Krenz of Mission Viejo, California
celebrating their 56th Wedding Anniversary

James and Linda Pierce of Placentia, California
celebrating their 51st Wedding Anniversary

Ralph and Patricia Cameron of Victorville, California
celebrating their 50th Wedding Anniversary

Norman and Helen Nichols of Cottonwood, Arizona
celebrating their 50th Wedding Anniversary

The Silent Majority

by Stan Guzy



FULLERTON, C. GORDON, COLONEL, USAF/NASA ASTRONAUT, 76 – died on August 21, 2013 in Lancaster, CA from complications of a stroke he suffered in 2009. He received an M.S. degree in Mechanical Engineering from Cal Tech and entered the USAF in July 1958 after working as a design engineer for Hughes Aircraft Company. Trained as an F-86 interceptor pilot and a B-47 bomber pilot, he graduated from Air Force Test Pilot School at Edwards AFB and was assigned to the Air Force Manned Orbiting Laboratory (MOL) program. With cancellation of the MOL, he joined NASA and piloted the Enterprise during the ALT tests at Edwards. He was Pilot on STS-3 and landed at Northrop Strip, White Sands due to heavy rains at Edwards. He was Commander of the STS-51F "Spacelab 2". Colonel Fullerton became a research pilot at NASA's Dryden Flight Research Facility at Edwards where he participated in a wide range of tests piloting 135 different types of aircraft. He retired in 2007 and suffered a stroke in 2009. Among his many awards was the Distinguished Flying Cross and the Iven C. Kincheloe Award from the Society of Experimental Test Pilots in 1978.

CHRISTIANSON, WALTER R., 97 – died peacefully at home in Auburn, CA on June 12, 2013. Walter served for 28 years, retiring from the General Offices as Director of Management Control in 1970. His second wife, Patricia, served in Engineering for 10 years.

CLAUSS, THEOPHIL "TED", 82 – passed away with his family around him on July 12, 2013 in Meridian, Idaho while on vacation. After serving in the Air Force, Ted began his aerospace career as a "flight line jockey" with Douglas Aircraft then moved on to a more challenging assignment with NAA in 1958 as a liaison engineer of flight operations. He had an illustrious NAA career spanning the Hound Dog project through the Apollo program and finally the Shuttle Project where he was designated as Site Director of the Palmdale Plant. Ted retired from the NAA Space Division in 1991 after 33 years of service. He is survived by his wife of 33 years, Judy.

DRISKELL, JAMES E., 94 – passed away on March 11, 2013 in Grand Junction, CO. "Jimmy" was a man of many passions. He was a ferry pilot for 27 years and narrated for the Bob Hoover Air shows. His ever present smile and zest for life will be truly missed by all who knew him.

GAZELLE, DONALD H., 91 – died peacefully at his home in Anaheim, CA on June 4, 2013. He was preceded in death by his beloved wife Pat in 2001. After serving in the U.S. Army Air Forces during WWII, he joined NAA at Downey, transferred to Autonetics where he worked in the Engineering Quality Control Office. He enjoyed a quiet retirement and will be missed by his neighbors and friends.

GOW, ROBERT JAMES, 82 – passed away on July 7, 2013 in Carson, CA. He served in the USAF during the Korean War and after his discharge went to work at NAA, NAA/RI Autonetics and Boeing. He served on many aircraft programs and all of the space exploration vehicles. He is survived by his wife of 54 years Judith.

HEMSLEY, CLYDE D., 84 – of Anaheim, CA, passed away on June 19, 2013 surrounded by his family. Clyde came to California in 1948 and joined NAA. He served 38 years, working on the Apollo and Space Shuttle programs. He is survived by his wife, Frances.

HENRY, THOMAS A., 93 – passed away peacefully in Torrance, CA on March 24, 2013. After serving proudly in the U.S. Army during WWII, Tom hired in at LAD in 1953 as a journeyman electrician. He enjoyed a 35 year career in various electrical/electronic maintenance positions until he retired from the B-1 Division in 1988 at the age of 70. He was a 63-year resident of Redondo Beach, CA and was preceded in death by his loving wife, Dorothy.

HOUTS, RICHARD C., 90 – died at home in Rancho Santa Margarita, CA on July 31, 2013. After serving in both WWII and the Korean War, he joined aerospace where his work spanned 30 years of service on a variety of projects from the Minuteman Missile through the Space Shuttle Program. He is survived by his wife of 65 years, K. Charlene.

JOHNSON, LOREN E., 88 – of Corona, CA passed away on June 20, 2013. He proudly served as a U.S. Army medical technician in WWII. After receiving an honorable discharge and advancing his educational pursuits, he went to work at NAA in 1948. He retired 40½ years later after working on aircraft structural assemblies, flight line modifications, hydraulic installations and tool making. His assignments included the F-100, missiles for the B-52, Hound Dog and the Apollo-Saturn Program. Loren was preceded in death by his "lady friend", Chris Babino.

JONES, DONALD L., 79 – died on July 23, 2013 at home in Duncan, SC as a result of a fall. After getting his degree from Purdue University, Don made key contributions to the development of a nuclear reactor for aircraft propulsion while working on the Aircraft Nuclear Propulsion Program (ANP) at General Electric and on the development of helicopters at Hughes Tool Company. At NAA, he served on the Apollo and Saturn S-II programs and was manager on the Shuttle Main Propulsion System (MPS) and the Orbital Propulsion System (OMS). Don retired from Space Division in 1991 with 31 years of service. He is survived by his loving wife of 58 years, Jenny.

JONES, ROBERT M., 81 – passed away peacefully at home in Mission Viejo, CA surrounded by his loving family. Bob was in Engineering Planning and Finances on the Apollo and Space Shuttle programs at Space Division when he retired in 1990 with 31 years of service. He is survived by his loving wife of 41 years, Lyn.

LANDIS, BRADLEY C., 82 – of Manhattan Beach, CA, passed away on May 22, 2013. Brad was hired in 1956 as an Engineering planner. Demonstrating his management skills, he advanced to Division Administration and Management Systems. Brad retired in 1986 with 35 years of service. He is survived by his loving wife of 42 years, Yolli, who is also an NAA retiree.

LARSEN, LAWRENCE L. "LARRY", 91 – passed away peacefully on December 2012 at home in Chester, CA surrounded by his loving family. His career began at LAD in 1938 at 40¢ an hour and advanced with many opportunities on the Minuteman and B-1 programs. He retired in 1979 with 40 years of service. He is survived by his loving wife of 74 years, Mary Kathryn.

MARTIN, DONALD A., 78 – of Costa Mesa, CA passed away on May 25, 2013 with his loving family surrounding him. Don retired from Space Division in 1990 with 33 years of service. He had a military internment at Miramar National Cemetery in San Diego, CA.

MOLESKY, ADOLPH J., 86 – of Anaheim, CA passed away on May 29, 2013. After completing his Army service in the Korean conflict, Adolph and his wife came to California. He secured a position at NAA/RI during which time he worked on the Minuteman Missile project and the Apollo Program. He retired to a very active private life after serving at NAA/RI for 35 years.

ROGERS, CHARLES E., 79 – of Yorba Linda, CA passed away at home on November 29, 2012 surrounded by his family. Charles retired from Autonetics where he worked on the Minuteman program in 1990 with 30 years of service. He is survived by his wife, Kay.

SEARS, MAXINE "MICKEY', 88 – died on July 20, 2013 in Norwalk, CA where she lived for 63 years. After serving at NAA/RI for 25 years, she went to work for the city of Norwalk in the Public Safety Department. She was honored by the City Council for her outstanding volunteer service. She was named Woman of the Year and Senior Citizen of the Year. She was a Public Safety Commissioner for 14 years.

TELLES, MIGUEL M. "MIKE", 77 – passed away peacefully, on August 3, 2013 in Encinitas, CA with his family by his side. After military service, Mike and his family moved to the Los Angeles area to seek a new life. He joined NAA/RI in 1959 and served for 33 years before retiring in 1992. His tenure at NAA/RI included such projects as the Space Shuttle, the B-1 and various submarine system programs. He is survived by an extended family, including his dear friend, Judy Wasson.

TRUMBULL, WARD D., 86 – passed away on July 1, 2013 from unspecified causes. He moved to Long Beach, CA in 1934. He served 47 years NAA/RI before retiring in 1995. He is survived by his wife, Anne.

UNTERBERG, WALTER, 88 – passed away of cancer at home in Los Angeles, CA on June 26, 2013. Born in Austria, emigrated to and educated in England. Walter came to Flint, MI where he taught at the General Motors Institute of Technology. Moving on to aerospace in 1950, he obtained his Ph.D. from UCLA in 1964 and served at Rocketdyne and the Science Center. He retired in 1985 and became an outstanding musician, conducting orchestras and opera productions. He had a zest for life, a passion for the arts and many intellectual interests.

UPTON, EUGENE, 83 – passed away September 28, 2012 in Westminster, CA after a long battle with illnesses. He retired from NAA/RI after 40 years of service.

ZEMANSKY, STANLEY D., 98 – passed away on March 1, 2013 in Paradise, CA. Stan retired from Autonetics in 1962 with 25 years of service. He was in Procurement and worked on a multitude of programs, including the Apollo and B-1.

LOST SHEEP, BULLETIN RETURNED WITH NO FORWARDING ADDRESS

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DONALD F. LISTER – FRAZIER PARK, CALIFORNIA

SANFORD MARGOLIN – ANAHEIM, CALIFORNIA

JACK W. SMITH – COEUR D'ALENE, IDAHO

"Life is full of surprises and serendipity. Being open to unexpected turns in the road is an important part of success. If you try to plan every step, you may miss those wonderful twists and turns. Just find your next adventure—do it well, enjoy it—and then, not now, think about what comes next."

— Condoleeza Rice

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North American Aviation Retirees Bulletin

"Where The Best Never Rest"

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Photo courtesy of Billie McCamus Bower

The North American Aviation Memorial Bench Dedication began with the Wright-Patterson AFB Honor Guard posting the Colors with the playing of the National Anthem, followed by the Invocation by the Chaplain, Father Michael Kreutzer. It ended with the Benediction by Father Kreutzer, retirement of the Colors and "Taps" by a lone bugler.

NORTH AMERICAN AVIATION
Retirees Bulletin
"Where The Best Never Rest"

Winter 2013

Inside:

HOW WE LOST OUR NAME AND HERITAGE by John Moore

PROVIDING HYDROGEN TANK ACCESS ON THE PAD by Dan Nelson

THAT KIND OF DAY by Sam Sox



Painting by John D. Shaw, courtesy of the Artist

The North American Aviation P-51 Mustang, the greatest Allied fighter produced during World War II, significantly increased the survivability of American bombers of the 8th Air Force in raids over occupied Europe. Famous aviation artist John D. Shaw captures this moment in his latest painting **"Ramrod – Outward Bound"** ***depicting triple ace, Col. Clarence E. "Bud" Anderson in his famous P-51D Mustang*** **"Old Crow"** ***defending B-17s of the 100th Bomb Group.***

NORTH AMERICAN AVIATION
Retirees Bulletin

North American Aviation Retirees Bulletin, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAA Retirees Bulletin can be contacted at The Boeing Company, Seal Beach facility by phone at (562) 797-3836. Send mail to:

North American Aviation Retirees Bulletin
P. O. Box 3797
Seal Beach, CA 90740

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Dear NAA Retirees Bulletin Subscriber

With this issue we are embarking on our 15th year as an independent publication relying solely on the subscriptions, the generosity of our subscribers and the fantastic talents of our volunteer authors, artists and staff members. In the process of publishing over 50 quarterly issues, we have established four outstanding achievement awards in perpetuity and provided technical speakers for the U.S. Air Force Academy at Colorado Springs, Colorado and we have delivered North American Aviation Memorial Benches to the USAF Museum at Dayton, Ohio and the Naval Air Museum at Pensacola, Florida. God willing, we are not done yet!

The second NAA Memorial Bench has been delivered to the U.S. Naval Air Museum. We have received confirmation from Captain Ellis of the Museum that the bench is being uncrated and will be placed in a suitable location to be fully enjoyed by all visitors. In this issue, we provide an accounting of the donated funds received for the Bench Project and the amounts spent to date for the benches. We have contacted the Smithsonian Museum with an offer of a third bench. The response has been appreciative of the contributions made by North American Aviation to America's Armed Forces but negative to the idea of a Memorial Bench. So, we have turned to the NASA at the Kennedy Space Center in Florida with a similar offer. The decision is still being evaluated.

An old friend from KSC is upset because we have not included Rockwell International as part of our quest for the Memorial Benches. I was thinking of providing him with the reason and logic as to why we didn't. But, after some thought, it occurred to me that the report by John Moore which we published in 2002 and excerpted in 2010 would provide a much better argument why we would let hell freeze over before we would credit Al Rockwell with anything but the unnecessary destruction of the greatest scientific company ever assembled. Hence, in this issue we bring back *How We Lost Our Name and Our Heritage.*

Always on the hunt for stories about North American Aviation that few people have ever heard about, we received a great article from Dan Nelson about his participation on a design/fabrication team that provided the means to inspect and repair the inside of the Saturn II Liquid Hydrogen Tank AFTER it was assembled and on the pad ready for launch. It is huge and there are no means provided to reach the top, inside the tank. Start from there...!

Many of you have asked about another "Punchy" story about the *"Blue Nosed Bastards of Bodney"*. Punchy Powell has too many projects going but historian, archivist, photographer and author Sam Sox came up with the story of Major George Preddy, one of the greatest P-51 Mustang Aces of WWII. You will love it!

The paintings on our covers are by one of America's finest aviation artists. He is John D. Shaw. His home office, Liberty Studios, is located in St. Augustine, Florida. We asked him to let us use *Ramrod – Outward Bound* for the front cover. Then we saw *The Hornet's Nest* and we asked for that too. John very graciously gave us permission for both paintings and provided us the proofs for the Bulletin covers. When you meet people like John, it makes the job of being Editor a humbling and a grateful experience.

Again, with the end of the year, it is time to renew subscriptions. Check the date above your name on the address label. **If it says DECEMBER 2013, THIS IS YOUR FINAL ISSUE AND YOU MUST RENEW.** You don't have to cut out the coupon or mess up this copy of the Bulletin. Just write out a check made out to BALD EAGLES INC. and send it to:

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As the year draws to a close, where the world has gone mad and our nation is in chaos may we wish you, our good friends and subscribers, all God's Blessings of peace, good health and long life. *AMEN! SHALOM ALEICHEM!* Please include Sonnie Robertson in your prayers.

How We Lost Our Name and Our Heritage

by John R. Moore



Editor's Note: Over the past several years, we have been asked repeatedly how we lost our name – North American Aviation Inc. Rather than trying to define this bewildering case of guile and deceit ourselves, we rolled back the NAA Retirees Bulletins to the Summer 2002 Issue which contained the article by John Moore. We extracted the following segment of his remarkable report that covered this dastardly deed!

With the help of Morgan Stanley as NAA's investment banker, a deal was worked out for the Rockwell Standard merger, with NAA as the surviving corporation with Lee Atwood as the President and CEO, Al Rockwell as the Board Chairman and a new Board of Directors composed of a combination of all the directors from both premerger boards (12 from NAA and 12 from Rockwell Standard).

The merged company was called North American Rockwell (NAR) and I was given the job as President of the former seven NAA divisions and the Science Center involving 94,000 people. This was called the "Aerospace and Systems Group" (A&SG). Meanwhile, Rockwell had hired Bob Anderson from Chrysler and he became President of the former Rockwell Standard divisions and Al's plethora of new acquisitions and subsidiaries called the "Commercial Products Group" (CPG). Wally Booth was then brought in from the automobile industry as Chief Financial Officer. These two extremely competent executives and I were members of the Board of Directors and together with Atwood and Rockwell constituted the Executive Committee of the Board.

In September 1968, when the merger was a year old, Al Rockwell, who could be convincingly charming as any man alive, is reported to have approached Lee and said something like, *"Our Board with 24 members is too large to be effective. We are one company now and it no longer is a board made up of NAA and Rockwell Standard members, so I recommend that we reduce the size of our Board by having all members over 70 years of age retire."*

Even before the merger, it had been recommended by a management consultant that the NAA Board be "modernized" by replacing all those over 70. Lee rejected the recommendation, pointing out that such a move would remove some of the Board's best contributors. However, this time, under the spell of Al's charm and because the Board was cumbersome with 24 members, Lee agreed to Al's proposal. This meant that five of the former NAA Board members would retire and only one from the former Rockwell Standard Board, Al's father. Despite the fact that NAA was the surviving corporation, the new Board now had 18 members – 11 from Rockwell Standard and only 7 from the former NAA.

The majority of Rockwell Standard members on the Board used the loss of the F-15 proposal to remove Lee as CEO and to force him to retire. The A&SG was disbanded and its divisions were reassigned to report to Bob Anderson. I and all the top people whom I had brought to NAA, except Donn Williams, were forced and/or chose to leave the company. Donn was made President of Autonetics. It now became clear that the nominal acquisition of Rockwell Standard by NAA had been a "Trojan Horse".

Thus, the book was closed on America's premier high technology aviation and aerospace company with the most respected name of North American Aviation, Inc. becoming a footnote on the pages of history.

We know that you are no longer with us, John, but thank you for being our friend and for this mind-boggling report. Only you could have told it as it was!

"The great enemy of the truth is very often not the lie—deliberate, contrived and dishonest, but the myth—persistent, persuasive, and unrealistic. Belief in myths allows the comfort of opinion without the discomfort of thought."

— John F. Kennedy

Providing Hydrogen Tank Access on the Launch Pad

by Dan Nelson

Early in my career at North American Aviation, I had an opportunity to work on a design/fabrication team that produced access equipment which would allow complete inspection and repair of all inside surfaces of the Liquid Hydrogen Tank of the Saturn S-II stage while on the launch pad at the Kennedy Space Center (KSC). Today, in management terminology, it would be called an "enterprise team" but in those days it was just another challenge to be met to get us to the Moon before the end of the decade. NASA Marshall Space Flight Center (MSFC) authorized the building of the access kits in 1967 with certain constraints on budgets and schedules. Money was becoming tighter because of the Apollo fire, the redesigns of capsule and the ramp up of spending on the flight stages, flight acceptance tests and the assembly of flight stages at KSC. There had been hardware problems with the fuel line duct outlet, tank stringers and rib ends during the S-II-F Facility stage checkout at KSC. The S-II-1 flight stage also had some structural anomalies that required LH_2 tank access. Since the existing tank entry ground support equipment (GSE) would not work unless the vehicle was rolled back to the Vertical Assembly Building (VAB) and then destacked, KSC decided to fabricate ladders on site that could be attached to the tank side walls and allow close inspection of the tank baffles. The "Bat Ladders" (Batman-mania was in full swing on TV) as they became known, were fabricated by the KSC personnel from locally available aluminum ladders and vacuum pads with brackets attaching the pads to the ladders to give limited vertical access to the sidewalls of the tank only. A short time later, cracks were detected in the sidewalls of the S-II-T vehicle at the Mississippi Test Facility. The Bat Ladders were once again used to access the sidewalls of the LH_2 tank for inspection.

The new access equipment authorized by MSFC was to provide total access to all inside surfaces of the tank. This presented challenges in management, design and fabrication. The management challenges included reduced spending on a standard piece of ground support equipment. The design challenges were creating access platforms for the sidewalls and the underside of the forward bulkhead. Fabrication challenges included building the GSE on as short a schedule as possible and eliminating as much peripheral paper work as possible. The two access sets were designated as Special Design Development (SDD) equipment to avoid a lot of paperwork associated with normal GSE equipment such as drawing checks, spares assessment, formal design reviews, interface control drawings, etc. The drawings were created just like the normal GSE drawings with the appropriate format, specifications and notes. They were released into the standard drawing release system. However, the drawings had limited distribution to other departments within the Saturn S-II program.

The tooling department within the manufacturing area was designated to build the equipment for two major reasons: they had their own purchasing group and any fabrication changes could be handed on red lined drawings through single points of contact in the tooling and engineering departments. This arrangement allowed significant cost and time reduction by eliminating a lot of engineering change orders and shortening the ordering cycle for materials and hardware for quick resolution of problems.

The major engineering problems with the previously fabricated Bat Ladders were that there were no designated GSE attach points for the ladders and they would tend to creep down the sidewalls. They would come to rest on some unknown part of the flight structure and load it in a way that it was not designed for, which was not a good thing and made the stress engineers very nervous. Also MSFC wanted platforms for inspection and repair capability on the inside surface of the forward bulkhead as well as the tank sidewalls. The access hatch into the tank was in the middle of the 33 foot diameter forward bulkhead that could not be walked on and just 12 inches below the S-IVB stage's J-2 engine.

The ground support equipment department in Downey was asked to investigate to see if there was some way the S-II stage could be inspected while at the launch pad. The task of coming up with this new equipment was assigned to the special team headed up by John Greenwood. The ladders and vacuum pad system developed by KSC was evaluated but was found to be lacking in a couple of major areas. The first was personnel safety. The ladders were held to the tank wall by large vacuum pads that would peel away from the tank wall at any time if the source of the vacuum was lost thus allowing the technicians and ladders to fall to the bottom of the tank. The second reason was flight hardware. To retrofit attach points inside the tank at this time was out of the question due to the flight schedules in support of the moon landing.

Since the LH_2 tank was 33 feet in diameter and over 55 feet tall, it became quickly apparent that some sort of scaffolding built up inside the tank would not work, either. John Greenwood was able to secure a "gentleman's agreement" with the stress group, although they never formally approved it. The agreement allowed the tank ring frames to be used to react the vertical loads by feet setting on the small integrally machined lands in the tank wall and react the radial loads with clamps on the ring frames inboard face. This was a big design breakthrough that allowed the design effort for the internal access equipment to proceed.

The access ladders, which became known as "Robin Ladders" because they were smaller than the Bat Ladders, were designed with two cantilevered arms at the top of each ladder. The two cantilevered arms extended to the tank wall where there was a pad and a machined foot that rested on the integral lands in the tank wall. At the inboard face of the ring frame there was an over center clamp that, when thrown, locked the ladder to the ring frame. At the bottom of each ladder were two pads that rested against the sidewall and two side rails that swung down and interlocked with the ladder below it.

The platforms had similar feet and latches as well as pads to anchor them to the sidewall. Also, there was an installer assembly or hoist that was available to hoist up the assembled platforms and additional ladders as necessary. A bridge at the bottom of the tank located approximately at the same level with the top of the common bulkhead was used to span the distance from the dome over to the sidewall. Six standard Robin Ladders at six feet in length and one special ladder at five feet in length were necessary to reach to the top ring frame in the tank.

The most sophisticated design of the interior equipment was the curved flywalk that went from the center access hatch to the outside wall of the tank. This allowed detailed inspection and repair of the inside surface of the domed forward bulkhead. Truman Rudrow designed the flywalk to be in sections that could be slid under the J-2 engine and into the basket, lowered to the common bulkhead and assembled altogether with a vertical access ladder. When it came time to hoist up the flywalk, all the unnecessary personnel were removed from the tank. Anyone that was in the tank at this time was "trapped" there until the flywalk was secured to the tank's top ring frame. On the outside platform, the basket and pulleys were removed and replaced by a circular ring on which a carriage, pulley and a manual screw jack were mounted. When the winch hauled up the bridge and the access ladder up to the outside platform level, the ladder was attached to the carriage and the jackscrew was attached to the bridge via cables and lever arms. As the jack handle was turned, the bridge slowly rose to a horizontal position; the final attachment of the bridge to the ring frame was done manually from the platforms. Once the jackscrew assembly was removed, full access to the tank's interior surface was once again established. A small number of Los Angeles Division engineers were also enlisted to help in the design of the ladders, platforms and flywalk.

The external access equipment also had its design challenges. All of the internal equipment and personnel had to pass under the J-2 engine bell and then down some 45 feet onto the common bulkhead at the bottom of the tank. The 12 inch clearance problem was solved by manually gimballing the J-2 engine with cables attached with bolts in the interstage mating bolt holes and suspending a thin access platform just about an inch above the access hatch. This arrangement allowed about 20 inches of open height at the center to get men and equipment under the lip of the engine bell and down into the tank. If necessary you could stand up inside of the J-2 engine bell with about 6 feet of headroom. The platform consisted of aluminum I-beams and honeycomb panels that were suspended from the interstage structure of the S-IVB stage. Needless to say, help and approval was required from the McDonnell Douglas design engineers in Huntington Beach to support the platform from the S-IVB interstage. A similar arrangement to the tank's ring frames with feet resting on an interstage ring frame at four places was worked out with the Douglas engineers. Again, no formal interface control drawings were issued as a cost savings. An integral part of the platform was the winch and basket arrangement that was used to lower and raise men and equipment down to the bottom of the tank. The basket, made of vinyl coated nylon cloth with a fiberglass floor was suspended from three points with a stainless steel cable.

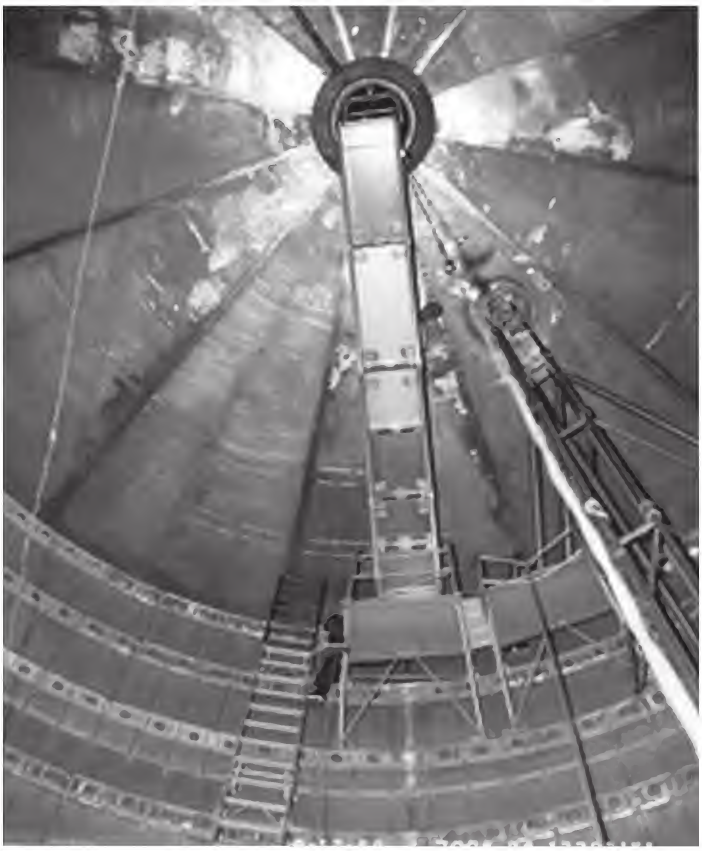


Photo by Dan Nelson

A view looking up at the under side of the S-II forward bulkhead. The flywalk is installed going from the center entry hatch to the tank sidewall. Below it are two platforms and to the side is a full set of ladders all clamped to the circular ring frames.

Once the drawings were completed and signed off they were released and sent to the tooling manufacturing group to purchase the raw stock and hardware in order to fabricate all the components of the two SDD models. Jim Whitley was the single point of contact in the tooling department for the construction of the two sets. There was an agreement with Quality Assurance that no engineering orders would be written for any changes, but the drawings change would be redlined, signed and the drawing impounded until the part was finished and a change drawing was released incorporating all of the redline changes for final inspection. All hardware changes were coordinated and approve by Whitley. At the time of final inspection, all drawings were updated as needed to match the SDD hardware.

The only fabrication "failure", and it was a purchased part, was when the pneumatic winch and its controls were tested for the first time. It lifted the test weight very nicely and when the air pressure was removed, the test weight came down just as quickly. This was not the design intent! John Greenwood had the winch sent to the laboratory and test folks at the Los Angeles Division to "investigate the problem". When it returned to Downey, it worked just fine, holding the load at any point when the air pressure was removed. It was determined later that the internal gearing (worm and wheel) in the winch box gearbox was changed without the benefit of a part number changes unbeknownst to the Inspection people at Downey. This was done in order to avoid delays in getting this unique SDD hardware delivered in time for the September 1968 demonstration test in Huntsville.

Jim Woodall and a group of technicians from the Kennedy Space Center came to Huntsville to become familiar with the access equipment and to demonstrate to the NASA folks at the Marshall Space Flight Center the feasibility of 100% inspection capability of all the interior surfaces of the LH_2 tank. Marshall NASA folks had set up in the Dynamic test tower the S-II-D stage and the S-IVB-D stage and interstage with a flight equivalent J-2 engine for the demonstration test. In less than three days, the folks from Florida and Downey had installed all of the



Photo by Dan Nelson

John Greenwood is extracting the demonstration "victim" from under the S-IVB J-2 engine on the external access platform with just a little extra clearance.

Editor's (I Was There) Note: In 1954, John Greenwood was conducting hydrostatic tests in Downey on the Navaho Booster which consisted of two large fuel/oxidizer tanks and a rocket engine. The booster was moved horizontally to the special testing tower at the Downey facility, raised to the vertical and then the tanks were filled with water. John was standing on an upper level of the tower when the full upper tank suddenly burst open and a huge wave of water came crashing down on John. Being a former paratrooper, John quickly sprang up on one of the vertical I-Beams of the tower and hung on. His quick wit saved him from a very nasty fall and possible death.

access equipment including the Robin Ladders, platforms and the forward bulkhead flywalk. I was personally able to check out the ladders, platforms and flywalk and they were rock solid. A successful demonstration test of the removal of an incapacitated worker from the bottom of the tank was performed with the safety engineer from Downey acting as the victim. He did a very good job as the victim! In the afternoon of the third day, tours were held for the interested NASA officials in and out and up and down the tank's interior surfaces. All in all, it was a very successful completion of a challenging access problem. The KSC team packed up the equipment after the tours and to my knowledge it was never used again for access on any of the S-II stages that flew.

About the Author: Dan is a retired manager of the Mechanical and Fluid Systems on the Space Shuttle Program. He started his 36-year career as a mechanical design engineer in Ground Support Equipment group on the Saturn S-II program. He also worked on the Apollo J missions to the moon as well as the Apollo-Soyuz Test Project before transferring to the Space Shuttle Program. As manger on the Space Shuttle program he was involved in the Orbiter upgrades after the Challenger accident, improved brakes, addition of the drag chute, Extended Duration Orbiter modifications and changes to the Orbiter to support Space Station supply missions as well as experiments carried in the Crew Module. Dan currently resides in Cypress, California with his charming wife Carol.

Congratulations and Best Wishes to

Eugene and Rosanna Dann
of Long Beach, California
celebrating their
67th Wedding Anniversary

Donald and Dorothy Lister
of Lancaster, California
celebrating their
64th Wedding Anniversary

Roger and June Schmidt
of Ogden, Utah
celebrating their
62nd Wedding Anniversary

Archie and Roberta Lane
of Cypress, California
celebrating their
61st Wedding Anniversary

William and Sue Dean
of North Tustin, California
celebrating their
60th Wedding Anniversary

Winston and Pansy Greene
of Valencia, California
celebrating their
57th Wedding Anniversary

Terry and Merle Nieuwlandt
of Placentia, California
celebrating their
57th Wedding Anniversary

Glenn and Beth Shell
of Meridian, Idaho
celebrating their
55th Wedding Anniversary

I asked the Lord in heaven above,
to help me find someone to love.
A caring person, loyal and true...
He heard my prayer and sent me you.

That Kind of Day

by Sam Sox, Jr.

6 August 1944, 10:00 am, White Flight is east of Berlin and heading toward Brandenberg to escort B-17s.

"Do I feel rough. Stomach rolling, churning. Great party! Too much to drink. That $1,200 pot I won will help the Group out in the Bond drive. Bed at 4:00, up at 4:30. Should have let Meyer take the mission as he had offered, really shook up Mason when I had trouble staying on the briefing platform. Let's see, 2,500 RPM. Manifold pressure 44 inches. Oil temp in the green, indication 300 knots, running great. No better ground crew than Lunn and McVay. Should be rendezvousing with bombers soon. Good wingmen, Doleac and Heyer. Stay in close. Mmmh, rolling again. Heck of a spot to get sick! Six hours from Bodney and 26,000 feet. Heads up! Big bomber boxes up ahead. Huns, thirty of 'em coming in line astern on the third box of '17s. Oh, no. Not here. Now? Got to clear my mask attack. Damn!"

What proceeded, following Major George E. Preddy's throwing up in his oxygen mask, was later described in a radio interview with Bill Shadel of CBS News in London.

"Our job was the usual one, escorting the bombers. We were meeting them north of Hamburg, escorting them on to their targets east of Berlin and part of their way back. About fifteen minutes after picking up the bombers, we saw thirty Bf 109s come in for a stern attack on the third box of B-17s. Our flight of three was the only protection around at that moment, although I was leading the group escort. We had altitude on the Jerries, so we went down after them. They saw us coming and although they showed no intention of leaving the bombers alone, they did pull out to the left in evasive action.

"We came up on their tail and each picked a Jerry. From about 300 yards, I gave mine a burst and set him on fire. I saw him go down in flames (score one). They were trying to hold their formation, but were sending singles and doubles out to slip up on us from behind. At about 26,000 feet, one that slipped out and was trying to get on our tail had to be dealt with by one of my wingmen, Flight Officer Cyril Doleac of New Orleans. Lt. Sheldon Heyer of Pearl City, Illinois and I kept after the main formation. I got in another burst and the pilot bailed out (score two). Lt. Heyer, to



Photo courtesy of Sam Sox, Jr.

Major George Preddy signing Aircraft "Form 1" on August 6, 1944 following flight where he set an ETO record destroying six enemy aircraft in a single mission.

my right and below me, set another one on fire. Then Heyer had to leave me and take care of those strays from the enemy formation. By this time, another single that had slipped out was down below me with the idea of coming up under me. I throttled down and slipped behind his tail just as he started up. Right after I gave him a burst, he went into a spin and then fell apart (score three). Luckily, just after that, four more of our fighters came in. It was now five of us against about 20 that were left in the formation after they sent their decoys and counted their losses. The Jerries still intended holding to formation. I got behind my fourth target and shot him down in flames (score four). Then they gave up on the bombers and went down fast in steep turns. I got one on the outside of a turn and closed in on him for a shot that sent him down (score five).

"As they started breaking their formation for the first time, our fighters scattered out for the chase. When a Bf 109 pulled up to get on my tail I had to turn into him-that was the first time I left off chasing the formation—and by this time our other fighters were off on their own. I got a short burst at the Jerry but missed. It was just the two of us then, and after I missed he had the edge on me. I went into a steep climb into the sun and as he followed me I could see him firing everything he had. He couldn't stay with me on that climb and dropped off. Then it was my turn again. I got behind him, and he must have known that his game was up. Before I could get a shot, I saw him fumbling with his hood above his head, trying to get out. When I hit him, the plane quivered a bit and started down, but he was out by this time, so I saw him float down without bothering him (score six). By this time I was almost to Berlin, so I set my course for home."

During the second week of April 1944, the 352nd FG would convert to the new North American Aviation P-51B Mustang. On his first mission, Preddy would score his fifth victory, a Bucker Jungmeister 133 trainer, expending only 87 rounds, and it was on the ground!

Preddy took immediately to the nimbleness and agility of the P-51 as he would double his score in the next five weeks, scoring a double kill on 13 May and getting 2½ more on the 30th. His total score now stood at twelve. His airplane, named *Cripes A'Mighty* would now display 12 crosses. He used full crosses on shared victories of which there were two.

Though the troops had not yet been informed of the exact date of the upcoming invasion of Europe, they were becoming more and more aware of its nearness by the increase in activity and security around the base. George Preddy, now promoted to the rank of major, assumed command of the 487th Fighter Squadron in the absence of Lt. Col. John C. Meyer, who was taking a 30-day leave back in the States.

"A day or two before D-Day," Sgt. Red McVay recalls, "*we were ordered to paint alternate black and white stripes around the wings and fuselage of our aircraft. For me, it meant adding them to the major's new P-51D,* Cripes A'Mighty 3rd. *We assumed something big was up."*

Nearly every enlisted man who didn't actually work on the planes was placed on guard duty while the painting was going on and was left there until after D-Day. They were placed strategically around the field so that no one either got on or left the field. Unfortunately, the guard assignments were done in such a hurry, that no one knew exactly where they all were, which would become a problem later in the day and in the days to follow.



Photo courtesy of Sam Sox, Jr.

A pensive Major Preddy, newly promoted Squadron Leader of the 328th Fighter Squadron, 19 Nov 1944.

The briefing for Major Preddy and the rest of the 352nd took place around midnight. Following the briefing, he and the rest of the squadron were to takeoff at 0250. The aircraft made their way to the takeoff area in total darkness, turning either to the right or the left to line up to line up for their takeoff run. By the time the second flight reached the final staging point, the first flight of four from the 486th FS had destroyed the small set of temporary runway lights. Blind takeoffs were now the order with compasses set on 05 degrees. Unfortunately, the second flight set their compasses on 50 degrees which would carry the fourth man through the volleyball court uprights. The flight had expanded into a flight of five, picking up Lt. Robert C. Frascotti who had failed to take proper position due to the confusion. When the ground crews heard the roar of the accelerating aircraft they began to cheer and applaud. This was the beginning of the end for which they had all been waiting.

Suddenly, all hell broke loose! The jubilation was shattered by a tremendous explosion. A huge fireball erupted from the area of the newly constructed control tower. Lt. Frascotti's P-51 had crashed into the darkened tower. Any fear of a night takeoff was no longer an issue for the rest of the group for it was now as bright as daylight.

The 487th flew three patrols on 6 June. Preddy flew two of them, spending a total of 9½ hours in his new P-51. As the Luftwaffe was not to make an appearance that day, targets were limited to motor vehicles and armor.

Ground crews were informed that aircraft were to be in the air as much as possible that day which meant new drop tanks and spark plugs were to be acquired and prepared for the fighters' return. The crews began to go to chow in shifts. When Red McVay returned from the mess hall, he noticed ambulances in the 487th area. He watched them go past on the perimeter



Photo courtesy of Sam Sox, Jr.

Major Preddy's most famous* "Cripes A'Mighty 3rd" *with 487th Armorers Sgts. Dodge, Dugo and Winsch, August 1944. Victories are indicated along edge of blue cowling.

road heading for the hospital. It turned out that many of the men had a powerful type of food poisoning causing the afflicted to void at both ends! Men were dropping in their tracks in excruciating pain. The security around the base became very threatened as guards and Officers of the Day wre immobilized where they were positioned. The unit flight surgeon discovered that it was caused by a spoiled batch of rice pudding.

Preddy flew eight more missions after D-Day before he would be able to try out *Cripes A'Mighty 3rd* on the Luftwaffe. He scored his first victory in his new bird on 12 June. On 18 July, Preddy and *Cripes A'Mighty 3rd* really got their act together. It appeared that his ground crew, comprised of Sgt. Lew Lunn, Chief; Sgt. Red McVay, Assistant Chief; and Sgt. M.G. Kuhaneck, Armorer, had fine tuned the P-51 to its ultimate capacity. Preddy later reported, *"I was leading the squadron on a sweep south of the bombers and heading north to intercept the bombers. Yellow Leader called in bandits at four o'clock low. I made a right turn up sun of the enemy formation which consisted of a mess of Ju 88s with many Bf 109s as top cover. I took my flight of three—Lts. Vickery and Greer and myself—to attack the Ju 88s, about 50 in number, while the rest of the squadron dealt with the top cover. As we approached the formation, I saw a single Bf 109 ahead of me and attacked it from quarter stern. I opened fire at 400 yards and drove up his tail. The enemy aircraft was covered with hits and went down burning and falling apart.*

"I continued in to attack the Ju 88 formation and opened fire on one of them, knocking many pieces and setting the plane on fire. Lt. Greer then called a break to the right as a Bf 109 was pulling up on my tail from below. After we broke, the Bf 109 stalled out and went back down. During this maneuver, Lt. Greer became separated. Lt. Vickery and I then made a 360 and launched another attack on the main formation. I damaged one with a few hits and drove up the rear of another, getting hits all over this one. I believe the pilot and crew were killed as the enemy aircraft began smoking badly and went down out of control with parts of the ship falling off. I pulled out to the side before the third attack on the formation. I came in astern again. In this attack, I plastered one Ju 88 causing both engines to burn, and the enemy aircraft disintegrated. I got a few hits and damaged a second Ju 88. I was out of ammunition—or so I thought, but later I learned that my guns had a stoppage on one side and I had been hit in the engine by the rear gunner in the Ju 88s. My ship was covered with oil sprayed from an enemy aircraft which had been shot down, so I set course for home with Lt. Vickery. Claimed: three Ju 88s destroyed, one Bf 109 destroyed, two Ju 88s damaged." (It should be noted that Luftwaffe records indicate that Preddy's victories were with Me 410s, not Ju 88s, which were operating in the area of the intercept.) The destroyed claims would later be adjusted to a total of three destroyed and three damaged.

Preddy's expertise in the P-51D-5-NA would be noticed not only by his unit but also by North American Aviation technical representatives who were in England. The biggest complaint about the new bubble canopied P-51 was its loss of some of its lateral stability due to the new full vision canopy. Although the new canopy eliminated the blind spots that were present in the earlier P-51B, it was not as stable a gun platform. Preddy's multi-victory successes made it evident that he had learned how to compensate for this instability and was having great success with the new model. Technical representatives from North American Aviation appeared at Bodney shortly after the 18th and debriefed him thoroughly about his impressions of the D model Mustang. It now appeared that he could not miss. On each of the next four missions; 20, 21, 29 July and 5 August he scored victories, bringing his total now to 17½ aerial and 5 ground.

Of these dates, the victory on the 21st is particularly interesting for it illustrates the knowledge and trust pilots acquire of each other when they have trained and flown together as Col. John Meyer and Preddy often had done. Meyer was leading the group that day with Preddy acting as Squadron Leader. Northeast of Munich, Preddy spotted a single contrail and, upon close examination, discovered eight additional Bf 109s slightly below. He took the squadron to intercept them while Meyer led the rest of the group to rendezvous with the bombers. Preddy and his flight were now at 27,000 feet and the Bf 109s were 3,000 feet higher. The blue-nosed P-51s climbed towards them from four o'clock and came in dead astern. Preddy recalled that their closing speed was very great considering a climbing attack. He opened fire on one of the enemy aircraft at the left of the formation from 300 yards and 30 degree deflection but noticed no strikes. As Preddy passed him, he pulled over to the right and fired at another from 100 yards, but was thrown into a spin by the prop wash of the enemy aircraft. He recovered at 15,000 feet and saw a P-51 being pursued at close range by a Bf 109. It was Meyer.

As Meyer and his flight approached the bombers, they encountered a large flight of Bf 109s determined to split up the formations. A dogfight developed and, suddenly, Meyer had a Bf 109 on his tail which he could not shake. He put his P-51 into a tight Lufbery and the Bf 109 followed. Neither gained an advantage. It was a stalemate with the enemy firing short bursts at him. However, Meyer knew that the thought of his running out of fuel put him at a great disadvantage. He realized that he could not hold this maneuver as long as the German, but then he noticed that another P-51 had slipped up on the Bf 109 undetected. He could tell from its blue nose, that it was one of his own. In what seemed like hours, he finally made radio contact. He could tell from the slow drawl that it was Preddy. George was still out of range and was shadowing the Bf 109 from six o'clock low. Meyer decided, based on his confidence in his friend—gleaned from those many hours of training together while at Hamilton Field—to pull back on his throttle to give the enemy the opportunity to close his range. More importantly, this would give Preddy an opportunity to close in on the enemy. The Bf 109 was still unaware that Preddy was on his tail. It worked. As soon as Col. Meyer cut his throttle a little, Preddy was able to gain an advantage on the Bf 109 and with one short burst score hits, causing him to break for the ground. Preddy fired again from dead astern and knocked his engine out. Meyer credited this action as saving his life and was forever grateful to his friend.

On 6 August, George E. Preddy, Jr. performed a record setting feat! As described at the beginning of this article, he destroyed six Bf 109s in less than five minutes, bringing his score now to 28½. For this achievement, he was recommended for the Medal of Honor. On 7 August, he performed a re-enactment of his victorious return to Bodney for the 8th Air Force photo team. He did not let the occasion for "legalized" barnstorming go by without taking full advantage of it. The troops really enjoyed watching him wring out the colorful Mustang. Shortly thereafter, on the 11th, he was awarded the Distinguished Service Cross, the Nation's second-highest award. In August 1944, George returned to the United States for a well deserved 30-day leave.

To Be Continued

About the Author: After serving in the Army, Sam Sox, Jr. entered the insurance business and retired in 1998. In the late 1970s he learned about the formation of the 342nd Fighter Group Association and their objective of producing a unit history. He volunteered to be its Photography Archivist. Meeting George E. Preddy's cousin, Joe W. Noah, the two decided to foster a memorial in memory of Major Preddy. Sam currently resides in Myrtle Beach, South Carolina with his charming wife, Sara Graham.



Photo courtesy of Sam Sox, Jr.

Major Preddy's last P-51 which he flew Christmas Day 1944 with ground crew Sgts. Kiltie and Kander.

Accounting of NAA Memorial Bench Project Funds and Update

by Ed Rusinek

Total Funds Donated $13,161.51**

Funds Expended

Dodds Monument

Air Force Bench $4,250.00

Naval Air Bench $4,200.00*

Total Cost of Both Benches $8,450.00

National Museum of the U.S. Air Force

Perpetual Care Fee $500.00

Mercury Mailing

Dedication Mailer – Printing, Addressing, Postage.....$914.46

Total Funds Expended $9,864.46

Total Funds Available..... $3,297.05

*Because most of the artwork was a duplication of the Air Force Bench, Dodds Monument absorbed the $700.00 cost of delivering the Bench to Pensacola.

**Includes late donation by:

H. Vernon Wolfe of Parker, CO, Columbus Division: In Memory of RA-5C IOIC Group at Columbus Division

John P. Fosness of Columbus, OH, Columbus Division: In Memory of All the Great NAA Employees Everywhere

From: Edmund Rusinek [mailto:kenisure@socal.rr.com]
Sent: Tuesday, September 17, 2013 1:14 PM
To: Dailey, John
Subject: NORTH AMERICAN AVIATION BENCH

Dear General Dailey,

I am the Editor of the North American Aviation Retirees Bulletin. We are all that remains of the greatest aviation and aerospace company that ever existed. We publish a twenty page newsletter quarterly. Our origins began with North American Aviation, continued with Rockwell and lasted for one issue with the Boeing Company. Boeing dumped us in 1999 after the one issue. Since then we have learned to thrive and prosper strictly on the subscriptions and contributions of our readers.

However, in viewing the aging of our subscribers, we realized that we must find other means of perpetuating who we were and what we have accomplished to inspire future generations. Hence, five years ago, we endowed for perpetuity four North American Aviation Recognition Awards to be presented to the outstanding graduating cadets and cadet-candidate at the United States Air Force Academy---two from Aeronautics, one from Astronautics and one from the Prep School. Although our company no longer exists, for the past three years we sent speakers to present technical reports to the cadets and the Colorado Springs Section of the AIAA. We are the only company, active or not, to do this.

Last year, one of our subscribers visited the USAF Museum at Wright-Patterson AFB in Dayton and noticed several walls with plaques representing every aerospace company in existence, including Rockwell and Boeing. However, there was none for North American Aviation. We met with the Museum Director, Lt Gen John Hudson, and his staff and received permission for a memorial bench in memory of our company. We held a fund raiser and acquired enough funds for a black granite bench at the USAF Museum in Dayton, a second bench at the US Naval Air Museum in Pensacola and, if possible, a third at the Air & Space Museum at the Smithsonian.

I was going to mail you all this information but I was advised by Ms St. Thomas to forward it by E-Mail for security reasons. Therefore, I am attaching our last three issues of the Bulletin which will provide you much better details of what I am asking you to consider. To the point, I am asking for acceptance of a black granite Memorial Bench honoring North American Aviation, Inc. to be placed, hopefully, next to one of our aircraft or spaceships on display. I remain,

Cordially yours,

Ed Rusinek, Editor

(562) 431-6960 KENISURE@SOCAL.RR.COM

P.S. If you would like to use one of our article in your Air & Space Magazine, please do, identifying us as the source. George Suzuki was a junior high school student in Tokyo when the Doolittle Raiders came over. His story is in the Summer Issue.

Subject: RE: NORTH AMERICAN AVIATION BENCH
From: "Jakab, Peter" <JakabP@si.edu>
Date: 9/19/13 9:17 AM
To: "'kenisure@socal.rr.com'" <kenisure@socal.rr.com>
CC: "Dailey, John" <daileyjr@si.edu>

Dear Mr. Rusinek:

Thank you for your note. General Dailey asked me to share our thoughts with you about your proposal. First, let me say we agree that the myriad achievements of North American Aviation should be recognized. The many employees of North American Aviation should be rightly proud of what they have contributed to aerospace. As I am sure you are aware, the Smithsonian's National Air and Space Museum has long contributed to the recognition of North American Aviation with the prominent display of milestone aircraft produced by the company. The North American X-15 and the North American P-51 Mustang to mention just a couple. We just recently added a North American F-100D to our presentation at our Steven F. Udvar-Hazy Center. These historic aircraft are among our most popular and, of course, played significant roles in aerospace history that we emphasize.

With regard to your proposal of a memorial bench to be displayed in our museum, we would have to respectfully decline the offer. As you can imagine, that would set a precedent for many other organizations requesting similar objects on display. Being the National Air and Space Museum, representing all aspects of aviation and spaceflight, one could see how these sorts of displays could become quite numerous if we fairly recognized all who would want this type of presence in the National Air and Space Museum. We think it best, and most educational for our visitors, to represent the accomplishments of aerospace companies in our historical displays. In the case of North American Aviation, we have artifacts of great historical significance produced by North American Aviation on display in both our buildings. We are very pleased to have these aircraft in our collection and the opportunity to preserve and exhibit them for many generations to come. We will continue to recognize the contributions of North American Aviation in this way.

Sincerely,

Peter L. Jakab, Ph.D.
Chief Curator
National Air and Space Museum
P.O. 37012, MRC 312
Smithsonian Institution
Washington, DC 20013-7012
(202) 633-2631
E-mail: jakabp@si.edu

NAVAL AVIATION MUSEUM
FOUNDATION

01 July 2013

Nolan Leatherman
18 Eastlake Road SW
Reynoldsburg, OH 43068-1404

Dear Nolan,

I have confirmed with the Director of the Museum that the bench seat you proposed recognizing North American Aviation, Inc. and the contributions of North American Aviation to our country can be displayed on the Museum grounds.

My plan would be to place the bench at a prominent location near the National Flight Academy where it could be viewed and used by the greatest number of visitors. From the literature you provided as well as the pictures, I believe it will be a significant addition to the Museum.

I appreciate the generosity of your organization in funding this marble bench for us and look forward to its arrival.

Sincerely,

Charles E. (Ed) Ellis
Captain, JAGC, USN (Ret)
Vice President/Corporate Secretary
Naval Aviation Museum Foundation

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A Significant Anniversary

The Columbus Division of North American Aircraft was closed a quarter-century ago, in 1988, just a decade before the sale of all of NAA's historic legacy businesses to Boeing. In June of that year, some 200-300 Columbus Division engineers, production and management people gathered in their old company park to honor a business to which they had devoted a good part of their lives. Although little notice was afforded to the gathering at that time, a moving record of the event has recently come forth, written by an engineer whose thoughts very well describe the cherished memories of the group assembled there.

The warm and poignant recollections of greatness recorded in Jim Stauffer's memo are a memorial to the remarkable things accomplished by all of NAA's legacy businesses. And it preserves how truly blessed we were to be a part of the great NAA band-of-brothers during a consequential part of our nation's history.

A Once In A Lifetime Evening

Written by James E. Stauffer -- Columbus, Ohio – Summer 1988

To the casual eye, there was nothing remarkable about the group of several hundred greying men clustered around the beer stand in the park. It was hot for June – in the 90°s – but the oak trees filtered the late afternoon sun and the light breeze cooled and soothed. The beer went down easily and the men talked pleasantly and earnestly.

The men formed small, informal groups, but each one was making the rounds, so the composition of the groups was constantly changing. The goal was to make contact, perhaps for the last time, with all the others with whom they had worked and done great things over the course of a lifetime.

These men were specialists in the many disciplines of engineering it takes to design an airplane, and they had produced quite a few. One of these airplanes, however, changed these men forever. It made them as good as anyone in the world, and the airplane was an example of leading edge technology. It flew for the first time in 1958 and it still, in 1988, had features one would consider advanced. It was the A3J-1 VIGILANTE.

The times somehow encouraged creativeness, and it fed upon itself to produce one innovation after another. The men were sparked by it and stimulated to greater things. They developed a way of looking at things from all angles that produced superior, sometimes surprising, results. And they formed some lasting bonds from living through that time. To mention just a few of the features of the A3J-1 and its derivative, the RA-5C:

- Fly-by-Wire Electronic Flight Controls
- Modern Flight Control Stability Augmentation Systems
- Differential Horizontal Stabilizer Roll Trim and Control
- Wing Leading Edge Boundary Layer Control
- Zero/zero (zero speed, zero altitude) Ejection Seats
- LABS Maneuver for Bomb Delivery
- Solid State Electronics
- Sophisticated Failure Monitoring
- Variable Engine Inlet Geometry
- Droop Leading Edges with Power Actuators
- Linear Rear Ejection Bomb Bay

Of course, there were many more, and many of these were not original with the A3J, but reached their use in an operational aircraft when the A3J was deployed with the fleet.

A modern airplane, but sadly put to rest by the Navy. Still ahead of its time, but a victim of decisions and politics far outside the reach of the men assembled in the park that hot June day in 1988.

Like modern Mexican Indians bearing a tattered resemblance to their Mayan ancestors, these men were once members of an elite group. Rather than being separated by generations, though, their demise took place over 30 years. From a vital company of many thousands, the division had dwindled to the hundreds. The men in the park knew that their achievements now fall on deaf ears and they quietly tell each other how good they really were. There is no doubt that they could still do the job, but no one was asking for their services.

Now the plant is being closed. In the past, plant closings had been announced but had never happened. This time it was different. The doors would be shut. There was an air of inevitability about it.

The shadows gave way to darkness at the park. A dinner was served. The crowd began to thin. One by one, they said their goodbyes and drifted away. By eleven o'clock it was all over. Somehow it didn't seem fair. These men deserved better. The occasion deserved better. This was a meeting of giants.

Yet they came, drank beer, talked for a while as their shoes became coated with dust, and then left. No crashing cymbals or rolling drums. Just a few old guys, trying to get home for a good night's sleep.

That, my children, is the story of how your daddy became one of the world's greatest engineers. You may have noticed that there's not many left to talk about it. But, God, we were once good!

Editor's Note: The VIGILANTE was designed in 1955 with first flight in 1958 and fleet deployment in 1960. It provided the Navy with its first long range, supersonic high and low altitude carrier based aircraft. Other NAA divisions were significant participants: Autonetics designed the ASB-12 Bombing/Navigation System, providing accurate information for nuclear weapon delivery and later for the RA-5C Multi-sensor Reconnaissance System. NAA Los Angeles, working on the F-107, provided valuable early experience with stability and control of supersonic aircraft. The late Jim Stauffer was an engineer at NAA Columbus and his wonderful 1988 memo was brought to our attention by Art Eckles, Shel Burtner and Roger Wood, also of NAA Columbus.

Contrails From The Past

by Ed Rusinek

Dear Mr. Rusinek,

Thank you for checking to find any retirees that remember my grandfather, R. K. "Bob" Weebe. I was hoping someone at LAD, where he worked from 1937 to 1966, would remember him. He did teach literally hundreds of NAA engineers the techniques of Aircraft Design, called Lofting, by using Projective Geometry. Perhaps, there is still someone who took his classes.

I have been involved in aviation since attending the Air Force Academy (1976-1980) and as a pilot in the Air Force and Air Force Reserve (1980-2003). I still enjoy reading about aviation very much.

What you folks at North American Aviation did to advance aviation and space exploration is the most fascinating and impressive in history. I look forward with great anticipation to receiving the NAA Retirees bulletins.

— Lt. Col. Michael Gleichman, USAF Ret., Louisville, KY

Ed's Ans.: Thank you for your kind words about our North American Aviation. Its greatness was created by dedicated employees like your grandfather. I hope that your note here arouses someone's memory of him.

Dear Ed,

In the Apollo 14 article, Fall 2013 Issue, Naval pilot astronaut Alan Shepard comments during landing on the Moon, *"It's not pitch black down there and it's not an aircraft carrier plowing through the Atlantic."*

In the Contrails From the Past, Spring 2013, Apollo 12 Naval pilot astronaut Richard Gordon comments regarding high anxiety about landing on the Moon, *"No. As a Naval Pilot, landing on a carrier in rough seas did!"*

It appears that making a night landing on a carrier during rough seas is the ultimate test of Naval Pilot True Grit!

— William Hotarek, Ellensburg, WA

Ed's Ans.: The first Astronauts selected by NASA all had a background of combat/test pilot experiences because in spite of all the computations and backups, there was always a margin of the unknown! That is when their courage and decisiveness really stood out!

Dear Ed,

I just have to keep the Retirees Bulletin coming! Enclosed is my check. Last month I arrived at 94 years of age. My golf ball doesn't travel near as far as it used to. I think all of you folks do a great job on our Bulletin.

— Andy Anderson, Signal Hill, CA

Ed's Ans.: Every year we always look forward to your renewal note because it always makes us smile. May you keep that golf ball "traveling" for many years to come! Happy Birthday Andy!

Dear Ed,

During WWII, I worked at LAD in the sheet metal group on the P-51 Mustang. For my 93rd birthday, my family took me to John Wayne Airport and arranged for a ride in a TP-51 Mustang. The plane was a two-seater field modification during WWII to be used as a high speed transport for VIP personnel. Five P-51Cs were converted for this purpose.

The airplane had dual controls and a full set of instruments in the back seat. A parachute was strapped on after I was seated. I was permitted to fly the plane but the pilot, Jim performed a barrel roll. I thank my family for this wonderful and unforgettable gift!

— Gerald "Jerry" Funk, Brea, CA

Ed's Ans.: Wow Jerry! What a splendid birthday gift! Dang! Jerry, you make a great reporter with your story on the P-51 Mod. Happy Birthday and let's hear from you on your 94th!



Photo by Gerald "Jerry" Funk

Jerry Funk and his two daughters, Sandy and Diane, by the Collings Foundation's TP-51C Mustang.

Historic Aviation Art by John D. Shaw

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"The aim of every artist is to arrest motion, which is life, by artificial means and hold it fixed so that a hundred years later, when a stranger looks at it, it moves again since it is life."

— William Faulkner

The Silent Majority

by Stan Guzy



CARPENTER, M. SCOTT, 88 – Astronaut, Aquanaut, U.S. Navy Fighter Pilot, a man for all reasons, died of complications from a stroke in a Denver hospice on October 10, 2013. He lived in Vail, CO. Chosen in 1959, he became one of NASA's pioneering seven astronauts, known as the Mercury 7 astronauts. Three months after John Glenn's historic flight, Carpenter was launched into Space and completed three orbits of the Earth in his space capsule, *Aurora 7*. Although his mission led to many discoveries about space navigation, he would overshoot his landing zone by 288 miles. His perceived nonchalance by NASA, banned him from further space flights. Inspired by Jacques Cousteau, Carpenter turned to the ocean and joined the Navy's SeaLab II program where he spent 30 days on the ocean floor off the coast of California. He is survived by his wife Patty Barrett. Scott Carpenter joined the Mercury Program for many reasons. *"One of them, quite frankly, is a chance for immortality. Most men never have a chance for immortality."*

ADKINS, LARRY R., 74 – of Tustin, CA died on December 7, 2013 of complications from multiple myeloma. After obtaining his Ph.D. in physics from the University of Texas at Austin, Larry came to Autonetics and taught astronomy at Cerritos College. An avid traveler and photographer, Larry was involved in the discovery of the Temple of the Fox in Peru. He is survived by his wife, Lorna.

BEAT, ROY H., 80 – passed away to the fairways of heaven peacefully at home on September 2, 2013 after a short bout with inoperable cancer. Roy retired in 1992 after 30 years of commendable service. His management expertise in the field of Materials Acquisition and Utilization won the respect of the company and the DOD/NASA Customers. He is survived by his son, Mark, and his daughter-in-law, Michelle, and his beloved grandsons.

BLOSSER, RICHARD D., 85 – of Fullerton, CA passed away September 25, 2013. He served with the U.S. Army and the Marines before joining Autonetics. He is perhaps best remembered for his work on the Voyager Round the World flight as the communications specialist. He retired in 1987 with 29 years of service. Dick is survived by his loving wife of 31 years, Ruth.

BOWER, DONALD J., 81 – passed away in Burlington, NC on October 21, 2013. Recruited from the Stevens Institute of Technology, Don was involved in many space program launches including Navajo, Minuteman, Mercury, Gemini, Apollo, Skylab and Space Shuttle. He ended his 42 year career as Program Manager for Space Shuttle Support Services. He is survived by his loving wife of 58 years, Audrey.

BOYLES, HAROLD C., "HAL", 84 – of Ponca City, OK, passed away on October 4, 2013. Hal joined NAA at Palmdale in 1958 and attained a supervisory position in flight line inspection on many projects including the AJ3, F-100, J57, XB-70 and B-1A. His favorite was the XB-70, because he served on the project from its inception to its conclusion. Hal retired in 1983 with 27 years of service. He is survived by his loving wife of 48 years, Sue.

CHRISTIANSON, WALTER R., 97 – of Auburn, CA went to eternity peacefully on June 12, 2013. Walter retired after 35 years of service as Director of Management Control. He was 55 years of age at the time of his retirement. His second wife, Patricia also worked for NAA/RI in the Engineering Department for 10 years.

DAW, WILLIAM S. – of Prescott, AZ, passed away on October 11, 2013. Bill served as a buyer and subcontract administrator at LAD for 15 years when he retired in 1989. He will be missed.

DAHL, JEROME "JERRY", 93 – passed away at home in Santa Ana, CA on October 15, 2013. After serving during WWII in the South Pacific, Jerry went back to school and obtained degrees in Math and Physics which enabled him to achieve a position in the aerospace industry. He spent over 40 years at NAA/RI and McDonnell/Douglas. He is survived by his wife, Eunice.

DeNOBLE, JAMES H., 74 – passed away on September 4, 2013 and is survived by his loving wife, Bonnie. Jim retired in 1994 after 30 years of dedicated service. He worked on many programs including, Minuteman, Saturn V, Lunar Excursion Module, Space Shuttle and the B-1.

DRISKELL, JAMES E., 94 – passed away on March 17, 2011 in Grand Junction, CO. He was preceded in death by his wife, Wanda, in 2006. Jim was a man of many passions, he narrated for the Bob Hoover Air shows. He was the ferry pilot for the Shrike Commander for 27 years. He was inducted into the ICAS Hall of Fame in Las Vegas, NV which was the highlight of his career.

GOECKEL, JAMES E., 92 – of Venice, CA, passed away in Sun City, CA. Jim retired in 1982 with 32 years of service including 22 years in Engineering Administration & Planning and 10 years in the Engineering Personnel Department. His beloved wife, Margaret, also served in NAA Engineering in the development of the P-51 and B-25. She passed away in 1979.

KRAEMER, ROBERT S., 82 – died in Catonsville, MD. 0n August 20, 2013. At Rocketdyne, he had a hand in designing every rocket engine that sent Americans into Space until the Space Shuttle. He published several books on space travel and earned the Distinguished Service Medal, NASA's highest honor. He was married to Anne Kraemer for 59 years.

LEISY, DALE R., 85 – of Long Beach, CA died on July 1, 2013. Dale served for 26 years, retiring from Autonetics in 1978. He is survived by his loving wife, Ann.

MANN, TED L., 83 – of La Mirada, CA passed away on August 21, 2013. Ted retired in 1990 from Autonetics as shipping coordinator with 38 years of service.

McDIARMID, BARBARA K., 73 – passed away at home in Colorado Springs, CO on May 4, 2013. Barbara served over 45 years at Autonetics as an electrical technician. She was a bright person who enjoyed baking and gardening. She is missed!

McKEEHAN, KENNETH W., 91 – passed away on August 24, 2013. Ken started at Rocketdyne on large engine tests then moved to Space Division in Downey to work on spacecraft programs. He retired in the 1980s from Palmdale, serving on the B-1 programs.

ODELL, I. GORDON – of Aliso Viejo, CA. Bulletin returned stamped "Deceased". Gordon retired from Autonetics in 1976 with 19 years of service.

ST. DENIS, FAITH, 70 – succumbed to cancer on October 3, 2013 at her home in Oceanside, CA. Faith and her husband, Joe, both served at Space Division for 38 years; Joe retiring in 1997 and Faith in 1998. Joe preceded her in death last May.

TRANCHINA, JOHN, 94 – passed away in Mesa, AZ on August 12, 2013. John served at LAD in the Quality Control specialized function where he supported many aircraft production programs. He retired in 1987 and is survived by his wife, Josie. His daughter, Cathy Baker, is Vice Chairman of the NAA Bald Eagles Association and Hostess of our yearly Reunion Luncheon.

WONG, WALLACE WAI, 87 – of Gardena, CA made a peaceful transition to the afterlife on August 23, 2013. After earning his Aerospace Degree from Northrop University, he joined North American Aviation where he served for 25 years as a logistical and project engineer on various programs from Apollo to the B-1 bomber. He is survived by his beloved wife, Judith.

LOST SHEEP, BULLETIN RETURNED WITH NO FORWARDING ADDRESS

JOE COLETTA – HUNTINGTON BEACH, CA

MATTHEW DOUGHERTY – MARICOPA, AZ

P. RICHARD FIELDS – CLARKDALE, AZ

MARY R. McINTOSH – NEWHALL, CA

SANFORD MARGOLIN – ANAHEIM, CA

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ALVIN B. SHAW – TULSA, OK

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Huntington Beach, CA 92647
714-847-1678
cathy.baker12@gmail.com

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North American Aviation Retirees Bulletin
"Where The Best Never Rest"

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IF THE DATE ABOVE YOUR NAME IS DECEMBER 2013 AND YOU HAVEN'T YET RENEWED –
THIS IS YOUR LAST ISSUE!



Painting by John D. Shaw Courtesy of the Artist

***Lt. Col. James H. Doolittle and Capt. Marc A. Mitscher confer on the deck of the* USS Hornet *laden with sixteen North American Aviation B-25 Mitchell bombers as the fateful day of 18 April 1942 approaches. Encountering a Japanese patrol boat, the bombers were launched earlier than planned and over 150 miles further from the Japanese coast. The scene is brilliantly portrayed by Aviation Artist John D. Shaw in his painting* "The Hornet's Nest".

NORTH AMERICAN AVIATION
Retirees Bulletin

"Where The Best Never Rest"

Spring 2014

Inside:

THAT KIND OF DAY – PART II by Sam Sox
NAA AT CAPE CANAVERAL AND KSC – PART VII by Bill Edson
NAA AND THE EARLY DEVELOPMENT OF HELLFIRE by John Garvey



Photo courtesy of Donald Watson, NNAM, via Capt. Jim Shaw

Standing behind the newly placed North American Aviation Memorial Bench at the National Naval Aviation Museum at NAS Pensacola, Florida are Lt. General Duane Thiessen, USMC (Ret), Naval Aviation Foundation President and CEO and Captain Bob Rasmussen, USN (Ret), National Naval Aviation Museum Director

NORTH AMERICAN AVIATION
Retirees Bulletin

North American Aviation Retirees Bulletin, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAA Retirees Bulletin can be contacted at The Boeing Company, Seal Beach facility by phone at (562) 797-3836. Send mail to:

North American Aviation Retirees Bulletin
P. O. Box 3797
Seal Beach, CA 90740

NAA RETIREES BULLETIN VOLUNTEERS
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Dear NAA Retirees Bulletin Subscriber

With this issue, the first for 2014, we again unfurl our NAA Colors and charge ahead with another project to perpetuate the name of North American Aviation, Inc. for future generations of Americans as part of their heritage. In 2013, we accrued enough donations to deliver an NAA Memorial Bench to the Air Force Museum in Dayton and another to the Naval Aviation Museum in Pensacola. With the funds remaining and some help from you, our readers, we plan to install a third Memorial Bench at the NASA Visitors Center at the Kennedy Space Center in Florida. Based on the good news from Lee Solid and John Tribe at KSC, we have started the final drive for the NAA Memorial Bench. Comparable to the other two, this one will include all the magnificent Spacecraft, Rocket Engines and Electronic Systems designed, built and launched by North American Aviation or by other programs using North American Aviation hardware. We again come to you for financial support. We have the bulk of the funds needed from the previous drive but we could use another $1,000.00 for this one. Since more than half of the programs listed are Rocketdyne engines, this would be a good time for all you from Rocketdyne that haven't donated yet to consider this effort! If you plan to donate, please remember to include the person(s) you wish to remember in your gift for the bench.

Many of you have expressed your enjoyment of the "Punchy" Powell stories. We have the conclusion of the Major George Preddy story. Unfortunately, not all stories have a happy ending. This one doesn't either but it is a hero's story and it has to be told. In today's world, some of our young people seem to have never learned what is important and what should be protected at all cost! It isn't because they are not patriotic but only that so little has been asked of them. George Preddy and his generation were tempered like fine steel by the Great Depression and World War II provided the final test of their courage and endurance.

The Bald Eagles Reunion Luncheon this year will be held at a new venue. The Proud Bird proved to be intractable in negotiating a quiet environment and reasonable prices for the food. Although the Golden Sails is in Long Beach, it is on Pacific Coast Highway easily accessible from the 405 Freeway. Please carpool and make an effort to join us in another salute to those who are no longer with us and to break bread with those that are!

With our project to install a North American Aviation Memorial Bench at the Kennedy Space Center what would be more appropriate than another chapter of the NAA participation in the American Space Program at Cape Canaveral and KSC by Bill Edson. The saga continues in this issue!

From our Columbus plant we have another great missile article by John Garvey on the development of the HELLFIRE Missile. Being all the way in Ohio, most folks thought that the Columbus Division was used to build surplus aircraft in support of LAD. That may have started with that premise but it wasn't enough to support an entire facility. Columbus enlisted some brilliant engineers and managers to capture their own programs with great success. In his report, John Garvey provides that look in the looking glass!

For the fourth year we are sending an NAA Speaker to the USAF Academy to provide a technical presentation to the Astronautics and Aeronautics cadets. This year we are sending a double-hitter, father-and-son team: Chuck Lowry and his son, Allen. While Chuck will talk about the Past, Allen just retired from Boeing and he has some new insights to present to the cadets. Representing North American Aviation at the graduation ceremonies in May to present the NAA Outstanding Graduate awards for Aeronautics and Astronautics will be our Floyd Mohr.

At Press Time! We hear that some of you are not coming to the Bald Eagles Reunion Luncheon because of the longer distance to the new location in Long Beach. If you are coming, please check your friends in your area and offer them a ride if that is the reason they are not coming!

That Kind of Day – Part II

by Sam Sox, Jr.

Editor's Note: Part I ended with Major George Preddy destroying six Me 109s in less than five minutes, bringing his score to 28½ victories and returning to the United States on a well deserved 30 day leave.

Major Preddy returned to the 352nd Fighter Group in early October. On the 28th of the month, he was made commanding officer of the lowest scoring squadron in the group, the 328th. Major Preddy was a winner. He believed that in order to be an effective fighter pilot, you had to know your aircraft thoroughly. In order to operate effectively as a unit, you had to have proven leadership and his service record denoted that qualification.

Preddy was a man of few words and was not one for idle chitchat. It was noted that when he spoke, he usually had something important to say. Morale was low, with no esprit de corps. Shortly, after he assumed command, he strapped into his new *Cripes A'Mighty* and put on a really spectacular show for the squadron. Leading by example, his efforts to improve the performance of the unit began to pay off.

On November 2nd, the 328th, with its confidence now restored, destroyed twenty-four Me 109s. This set a new ETO record for enemy aircraft destroyed in a single mission. Preddy got another Me 109 and the 352nd scored a total of 38, also a record.

The mission on the 21st was the unit's most notable. The 352nd scored 221½ victories with the 328th getting 8½. Lt. Bill Whistler of the 487th tied Preddy's record with six victories in a single mission while Preddy got an Fw 190, making him the highest scoring active ace in the ETO with 25½ aerial and five ground victories.

The next eight missions were mostly uneventful with the enemy not challenging the Blue Nosed Bastards of Bodney. The winter of 1944 settled in rapidly in the ETO, making bomber and support missions difficult. At this time, German Field Marshall Gerd von Rundstedt capitalized on the poor flying conditions by striking deep into the Allies' lines in the area of Liege, Belgium on December 16th. The 9th Air Force, finding itself much in demand and greatly overworked, requested the 8th Air Force provide two fighter units to come to its support. On December 23rd, Preddy lead his 328th Squadron along with the 486th and 487th to a small remote 9th Air Force field located at Asch, Belgium denoted as Y-29. The field was so close to the German lines that aircraft in the landing pattern were occasionally fired upon by enemy antiaircraft units.



Photo from the Joe Noah Collection

Major George Preddy smokes a cigarette as he reviews the performance of his squadron with Lt. Col. John Meyer (right) after returning from a mission.

The 352nd was not accustomed to the tough living conditions it now faced. Living in tents was a far cry to the palatial townhouses the pilots occupied at Bodney. Most of the troops thought they would freeze to death the first night. They placed all their blankets on top of themselves instead of insulating their bodies from the cold below. American ingenuity came to the rescue when it came to a way to heat their tents, but not without high risks. An oxygen bottle was scrounged from a wrecked B-24. A petcock was attached to copper tubing extracted from the same wreck. The bottle was filled with high-octane aviation fuel which was then suspended from a nearby tree. It is a miracle that the little stoves did not explode when the raw fuel was introduced to the tiny burners! But the troops stayed warm.

The next day was spent getting the unit settled down and assembled. The ground crews who were transported in C-47s became lost and arrived a day late. The first mission from Y-29 was a milk run, no action. Christmas found flyable ceilings and two missions were scheduled that day. Preddy was to lead his unit on the second one, a support mission into Germany with the bombers from the 8th. Preddy led in *Cripes A'Mighty* with Lt. J. Gordon Cartee, a substitute that day, flying his new "K" model named *"Steph-N-Jane"* in the number 2 slot. The rest of the flight of four was comprised of Lt. Ray Mitchell in *"Carol"* and Lt. Duke Lambright in *"Geraldine II"*.

Cartee recalls, *"After tooling around for a while, due to no action, we were vectored to an area close to Coblenz, Germany, where enemy aircraft had been encountered. Preddy receiving the call said,* 'They started without us, let's go join them' *and immediately turned into that direction. Just as Mitchell was about to peel off, he looked up and spotted two Me 109s coming down on him and Lambright".* He called to Preddy for assistance, but there was so much chatter on the radio that Preddy never heard him. Mitchell believes to this day that, had Preddy heard his cry for help, he would never have placed himself into the series of events that were to follow.

Cartee continues, *"Preddy spotted two Me 109s and got into a Lufbery with the first one. Neither were gaining much advantage when all of a sudden another Me 109 cut in front of him. He eased up on his controls just enough, gave him a short burst, blazed it and then resumed his pursuit of the first one."* The Me 109 lost his concentration, seeing his buddy flamed and Preddy nailed him. Preddy's score now totaled 27½ aerial and 5 ground victories. Moments later, Preddy and Cartee were vectored to an area southeast of Liege where it was reported that enemy aircraft were strafing Allied ground troops.

As they neared Liege, they were joined by a white-nosed Mustang from the 479th Fighter Squadron, Lt. James Bouchier, who had become detached from his own squadron. From the initial intercept point, approximately 3 to 4 miles SE of Liege, Preddy, at a height of about 1,500 feet began to accelerate. Having picked out a long-nosed Fw 190 in the distance heading NE. He radioed a "Tally-ho" to Control and was immediately cleared to make the intercept. There was also some talk

between Control and Preddy about intense flak in the area of intercept and it being halted so the attack could be made. Unknown to Preddy, Cartee and Bouchier, their line of flight was taking them over the quad .50 caliber AA of 'A' Battery of the 430th AA Unit, attached to the 258th FABN XIX at the time, positioned on the west side of a large clump of trees about two miles south of Aachen, Germany. As they approached the AA gun positions, Preddy was hit first by ground fire, followed by Cartee and Bouchier. Cartee saw *Cripes A'Mighty* begin to lose coolant, the canopy came off and Preddy's plane began a chandelle maneuver to his left. Cartee also noticed that a tracer had entered his own cockpit and was smoldering on the floor of his plane. Without getting it out of the way, it could start a fire at his feet, so he kicked it around while still trailing Preddy. Lt. Bouchier's Mustang also was hit and began smoking. He too, broke left, climbing to about 1,000 feet were he realized he would have to bail out of his severely damaged plane. He released his canopy, rolled the aircraft over and dropped out and landed safely in the British sector several miles north of where he had been hit.

Further up from Preddy and Cartee's line of flight, now a couple of miles south of Weisweiler, Pfc. Charles Brown, Pfc. John Starzynski and Lt. Murray Grobman of the 258th FABN, XIX Corps, were standing at the northeast edge of a very large wooded area about 2½ miles southwest of the large church located in the little town of Langerwehe. They were startled by the sound of a sudden burst of quad .50 caliber guns mounted on a half-track behind them to their left. The burst lasted three or four seconds. When they looked to their left, just coming into their view was Preddy's Mustang, now upside down and approximately 200 to 300 feet above the ground and in a 20 to 30 degree nose down attitude.

Up in the steeple of the church in Langerwehe, were Sgt. Harold M. Kennedy and Cpl. Elmer L. Dye, both of the 104th Infantry Division. While the Battle of the Bulge raged just a few miles away, it was relatively static in their sector where the Division had dug in on the chance that the Germans might veer in their direction. Division headquarters had been set up in a large steel foundry just north of Langerwehe. Dye and Kennedy spent several hours in the church tower with binoculars watching the considerable air activity along the front.

Cartee recalled there were three Mustangs passing over a wooded area with a large church in their flight path. The woods northwest of the church were occupied by elements of the 555th AAA (AW) BN which was located on the northern edge of the German penetration. Their weapons were 40mm anti-aircraft guns and quad .50 caliber machine guns. They were assigned to protect U.S. troops from low-flying German aircraft. The ground was frozen, covered with snow and the sky was filled with snow and heavy clouds, making it easy for the German armor to move about.

The troops lined up for a hot Christmas dinner consisting of turkey, mashed potatoes, cranberries and pumpkin pie. T/3 Leo J. Thoennes, of "B" Battery recalls that he had just taken his mess kit of food and walked to the nearby gun section #4. Suddenly, before he could eat his dinner, what he thought was a P-47, actually an Fw 190 D-9 and a P-51 Mustang came over with their guns firing. The NCO in charge of the battery ordered his guns to return fire. Cartee remembers they started to receive heavy ground fire.

Kennedy recalled that as the Mustang passed over the church, firing from the 555th batteries became heavy and continuous. Lt. Mitchell, some distance away, recollects seeing multiple tracer rounds that gave every appearance of being "a whole field of golf balls," so intense was the antiaircraft barrage.

From their vantage point looking NE, Pfc. Brown, Pfc. Starzynski and Lt. Grobman saw Preddy fall from his Mustang at about 200 feet, his parachute not deployed. Brown recalls that within minutes of the crash, two Me 109s flew over the same path as Preddy without any of the AA guns being fired.

Both Sgt. Kennedy and Cpl. Dye went to the crash site of the Mustang and noted that the largest portion remaining of the Mustang was the engine. Kennedy recalled seeing a piece of the fuselage on which victory swastikas had been painted.

Lt. Cartee returned safely to the field at Y-29 and made an uneventful landing.

Back at Y-29, Art Snyder, Preddy's crew chief, waited patiently for his ship to return. Aircraft were landing and taxied past his hard stand. As the different pilots went by, they would give an accounting of how many victories they had gotten with their fingers. Shortly, a pilot came by him and when their eyes met, he gave him a thumbs down. Art knew then that his friend and commanding officer had been killed.

Lt. Mitchell, having successfully disposed of his attacker, landed and after parking *Geraldine*, was heading for his tent contemplating the loss of his leader when a fellow pilot asked him if he would join him for Christmas dinner in the mess tent later in the day? Mitchell replied, *"Christmas dinner?"* In his effort to survive, he had completely forgotten what day it was. It had been that kind of a day.

To top off their Christmas meal, a keg of beer had been delivered to the group. In tribute to their fallen comrade, its spigot was opened, but nary a cup was drawn.

George E. Preddy, Jr. has been labeled by many as the fighter pilot's pilot. The late Gen. John C. Meyer said of him that he was the best fighter pilot to have ever looked through a gunsight.

Editor's Note: This article was perhaps one of the most difficult to condense because of the tremendous amount of sad details involved, further deepened by the loss of his brother, Lt. Bill Preddy, shot down by ground fire on 17 April 1945. For additional photographs we turned to Preddy biographer, Joe Noah. Also, very helpful, were author Jay Stout, and our very own Blue Nosed Bastard of Bodney, Punchy Powell.



Photo from the Joe Noah Collection

Major George Preddy in his P-51D* "Cripes A'Mighty" *before his fateful mission on Christmas Day, 1944.

NAA at Cape Canaveral and KSC – Part VII

by Bill Edson

Early "Cold War" Timeframe Activity - 1945-1958

In 2013, while Part VII of this article was being written, I took the opportunity to discuss pertinent WWII related historical data which I hadn't provided previously and that I believe improved the quality and validity of my effort. The German missile development program was initially born of technology that had been invented prior to and during WWII. During the latter days of the war, German technical development of missiles culminated in the use of the V-1 flying bombs (buzz bombs) and V-2 missiles as an offensive weapon against our allies located primarily in London and/or Antwerp. Our nation's knowledge of existing space technology increased significantly as the end of WWII approached. Allied forces overran German-held territory and captured V-2 rockets, applicable associated hardware and other technical information involved in designing and launching missiles. With that information directly available to us, our involvement in a relatively new technology expanded rapidly. The final battle on European soil took place in late April 1945. After the death of Hitler and Mussolini, the allied forces took hundreds of thousands of prisoners that led to the German surrender in early May 1945. Part VI briefly discussed the initial development and test of a modified atom bomb in July 1945 at the Trinity Test Site on the White Sands Proving Grounds in New Mexico. When the Japanese government ignored the ultimatum of the July 26, 1945 Potsdam Declaration to surrender immediately or face the probability of "prompt and utter destruction", we took action. The test of the atomic device at the Trinity Test Site was followed by the detonation of an atomic bomb (Little Boy) that was dropped on Hiroshima, Japan on August 6, 1945. On August 9, 1945, a second atomic bomb (Fat Man) was dropped on the city of Nagasaki, Japan. The impact of those two atomic bombs had devastating results. Japan surrendered to the U.S. and its allies on August 15, 1945. During the latter phases of WWII, a less than cordial relationship had been established between the U.S. and the Russians and subsequent to the end of the war a "Cold War" was initiated between the two countries.

The Cold War is best viewed as a period of ideological tension that existed between Communism and Capitalism from the end of WWII through the late 1980s. In 1946, a U.S. government committee selected Cape Canaveral as a long range missile test facility. They chose the Cape because its climate was suitable for year-round operation and the area was uninhabited and isolated. In the same time frame, the development and expansion of the Atlantic Missile Range (AMR) to support missile operations from the Cape was initiated. Between 1946 and 1950 German engineers and technicians were brought to the U.S. under the authority designated by "Operation Paperclip" to support our design and launch teams at White Sands Missile Range. In the mid-late 1940s, combined teams of U.S. and German engineers conducted numerous launches of U.S. designed missiles and of modified German V-2 missiles previously shipped to this country. By the Fall of 1949, construction and installation work had begun at the Cape and on several down-range tracking stations. Initial work was nearing completion on ground clearing, access road development, and on the construction of the first concrete launch pad, Pad #3, at Cape Canaveral. In July 1950, Bumper V-2 #8 was the first rocket to be launched from Cape Canaveral while being supported both operationally and technically from the AMR. As time progressed the Cape Canaveral launch facility was expanded to include the construction of additional launch pads, a launch control facility and a landing strip on the Cape, Skid Strip, to support the recovery of winged vehicles.

The post-WWII era was a very turbulent period for the United States. The world around us was changing rapidly and as a country we had become fearful of the Soviet Union and of their militaristic activities. While the Soviets were expanding their military arsenal, the U.S. focus was on the Korean and French Indochina conflicts, the Cuban Revolution, home grown political and civil rights challenges and on the defense of the United States. In this timeframe, numerous national and international incidents attracted the attention, concern and fears of the U.S. populace. As a consequence of the unforeseen internal and external problems encountered, we initiated a process of cautious military re-arming to counter our concern. From 1950 through 1955, the U.S. launched numerous smaller winged missiles: Lark, Snark, Matador, and Bomarc. With the launch of Redstone #1 in August 1953, the Missile Firing Laboratory at the Redstone Arsenal inaugurated the testing of ballistic missiles that led to the initiation of a U.S./Russian "Space Race". On September 8, 1955, a directive from President Eisenhower dictated that the development of Intercontinental Ballistic Missiles (ICBMs) be given the highest national priority. Given that direction, the race with the Russians to develop ICBMs was on. With the new missile programs came the need for additional manufacturing and test capability to service a multitude of contractors. To satisfy that requirement a new industrial area was constructed at Cape Canaveral. By the late 1950s, the Cape skyline had developed some distinctive features. Umbilical towers rose along "ICBM Row" with fixed concrete launch pads, flame deflectors and vehicle pedestals that provided mounting and structural support for launch vehicles.

NAA Reaction To New Aerospace Contracts – 1950s

From the mid-1940s to the mid-1950s, NAA postured itself to capture several military cruise missile and space plane design and development contracts. Study and analysis of the Navaho cruise missile was initiated just after the end of WWII at a time when the U.S. Army Air Forces considered ballistic missiles to be technically impractical. However, U.S. strategic missile program development began late in 1945 and the Army Air Forces issued a request for proposals to 17 contractors to support a 10-year R&D study program of four different missile types. NAA management, facing a potential reduction of nearly 100,000 employees as wartime aircraft production orders were being cancelled, concluded that aerospace missile design, development and launch should become a future goal of the company and to make the necessary investment to win one of those contracts. The MX-770 Contract for a boost-glide missile, derived from the German V-2 concept, was awarded to North American Aviation on March 24, 1946. This vehicle eventually evolved into the Navaho cruise missile which provided a design base for future inertial navigation systems, rocket engines and missiles that

would eventually take Americans into Space. When the U.S. Army Air Forces became the U.S. Air Force on September 18, 1947, responsibility for the Navaho Program was transferred to them. In August of 1948, the Air Force called for the development of longer range ballistic missiles. In September 1949, in reaction to the Russian detonation of an atomic bomb and to the Communist victory in China's civil war, the U.S. military began to release funds in support of U.S. missile development programs. From 1949-1952, NAA provided support to the Air Force in the development of Navaho spin-offs. On December 23, 1952, NAA captured a full-scale development contract for the Navaho G-26 missile consisting of ten cruise missiles, thirteen boosters and five inertial navigation systems. The first delivery of the major Navaho missile components was scheduled for mid-1953 and the first launch for February 1956. On November 7, 1955, NAA divided the Navaho Program into three new divisions. The Mission Development Division in Downey was assigned responsibility to manage the Navaho Division and each of its derivatives. The Autonetics Division was given the responsibility to manage the inertial navigation systems and all other avionics products and moved from Downey to Anaheim. The Rocketdyne Division was assigned the responsibility for liquid rocket engines and moved to a new facility in Canoga Park. The three divisions were free to market their products on other company missiles. For the three divisions of our company the future appeared to be bright. Success of the Navajo Project put NAA in a commanding position to capture future launch vehicle and manned spacecraft contracts and to dominate the U.S. manned spaceflight market for the next 40 years. The delivery and launch of the first G-26 missile occurred six months later than planned due to numerous technical difficulties uncovered. Over the next year, the G-26 vehicle experienced numerous launch failures and the developmental test schedule slipped even further. While we attempted to resolve our technical difficulties, the Jupiter, Thor, and Atlas programs were successfully initiated and missiles successfully launched. By mid-1957, it was clear that these ballistic missiles had the capability to deliver a warhead over the same range as the Navaho but with far greater reliability. On July 12, 1957, in an announcement that shocked the aerospace world, the Air Force Headquarters terminated the Navaho development program. By the end of the month, NAA laid off 15,600 employees. Despite losing the Navaho contract, the outstanding performance by NAA in the structural, propulsion and inertial navigation disciplines put us in an advantageous position to capture future prime contracts and dominate the manned spaceflight arena for years to come.

In the mid-1950s, with the fear of a possible war with Russia still great, NAA successfully captured the X-15 and the Hound Dog contracts. The National Advisory Committee for Aeronautics (NACA), later the National Aeronautics and Space Administration (NASA), released proposal requests for development of the X-15 advanced aerodynamic rocket powered space plane. In November 1955, NACA negotiated a contract with NAA for the development of the X-15 structural airframe. In February 1956 NACA negotiated a contract for the X-15 engine systems with Reaction Motors. The space plane was introduced to the public on September 17, 1959. Over the duration of the program twelve pilots flew the X-15: five from the NACA/NASA, five from the USAF, one from the Navy and one from NAA. Like many X-series aircraft, the X-15 was designed to be carried aloft and drop launched from the wing of a B-52. The X-15 set speed and altitude records in the early 1960s, reaching the edge of outer space and returning with valuable data used in aircraft and spacecraft design. During the X-15 program, 13 flights by 8 different pilots met the USAF spaceflight criteria of qualifying the pilots for astronaut status by exceeding an altitude of 50 miles. Three X-15s were built and two B-52s were modified to support the 199 test flights flown over the duration of the project. NAA remained under contract with NASA until the final X-15 flight was completed in 1968. In December 1970, the X-15 was permanently retired from flight operations.

The North American Aviation AGM-28 Hound Dog was a supersonic, jet propelled, air to surface cruise missile. The Hound Dog was initially given the designation B-77, then designated GAM-77 and finally became the AGM-28. NAA designed the system so that two missiles could be carried on a specially modified B-52 bomber, one beneath each wing. Named after Elvis Presley's hit song, the air-launched missiles were designed to destroy heavily defended ground targets. The Hound Dog missile program began on March 15, 1956 when the Air Force issued a requirement for an air-to-surface missile be carried on the B-52 bomber. NAA won the contract in October 1958 and delivered the first production model to the Strategic Air Command (SAC) in December 1959. The first launch of the Hound Dog from a B-52 took place in April 1959. The missile was conceived as a temporary weapon for the B-52 bomber, to be used until the GAM-87 Skybolt air launched ballistic missile became available. Fortunately, the Skybolt missile was cancelled within a few years, and the Hound Dog was deployed until the missile was replaced by newer weapons, including the Short-Range Attack Missile and the AGM-86 Air Launched Cruise Missile. The Hound Dog was removed from active service in 1976. This program kept the NAA engineering and production staff together at the Downey facility through the late 1950s and early 1960s and formed the core group of the team that later won both the Apollo and Space Shuttle contracts.

U.S. Reaction to Russian Launch of Sputnik 1

At that time we experienced a significant setback as the Russians preceded us into space while relying on the thrust of a military ICBM to deliver their payload. Sputnik 1 circled overhead for three weeks before its batteries failed, the "beep-beep-beep" of its payload stopped and the satellite fell into the ocean. It became the significant motivator of our country and drove us to a more rapid acceleration of our U.S. civilian and military space activity. As we re-grouped from the surprise Sputnik launch of October 4, 1957, we cautiously reevaluated the status of our civilian and military missile design. In the following months review teams specifically addressed and determined how, when, why and who should assume management and control of both civilian and military space oriented activities. In doing so we specifically addressed existing and projected U.S. unmanned and manned space programs. Late in 1957, our response to the Sputnik crisis resulted in an acceleration of civilian and military missile programs and to space oriented Congressional activities. In January 1958, the Explorer 1 satellite was the first U.S. earth satellite to be launched by the Army Ballistic Missile Agency. It was launched from Cape Canaveral on a Jupiter-C vehicle, a modified version of the Redstone missile, and a direct

descendent of the V-2. As Cold War tensions continued to increase, larger missile systems were developed and launched from Cape Canaveral (i.e., Vanguard, Jupiter, Thor, Thor-Able, Navaho, Bull Goose, Polaris, Atlas, Titan, and Minuteman). Sometimes the launches were successful but unfortunately they sometimes failed. In July 1958, the Congress approved the National Aeronautics and Space Act. It also clarified NASA management responsibilities and their goals and objectives. When the Space Agency was established in 1958, supremacy in Space while performing planetary exploration were two of the more significant objectives considered by politicians, the military, scientists and launch vehicle and spacecraft designers. In operational terms, the objectives provided instructions to explore and to utilize the atmosphere for peaceful and scientific purposes, while at the same time providing research support to the Department of Defense. The NASA formally opened their offices on October 1, 1958. On October 7, 1958 NASA approved the development of the Mercury capsule which was designed to carry a single astronaut into space and was established in an effort to learn if and how humans would survive a space environment. In December 1958, NASA posted civil service notices inviting applicants to compete for astronaut service jobs at levels GS-12 to GS-15 which paid salaries up to $12,700 per year. On April 9, 1959, the first seven Mercury astronauts were selected. Late in 1958, Saturn design studies were authorized to proceed at Redstone Arsenal with the development of a single stage, 1.5 million pound-thrust, clustered engine under the guidance and direction of Wernher von Braun. A master layout of the Saturn I Launch Complex was made available in 1959 and preliminary construction work was started at Launch Complex 34. The first successful flight of a highly instrumented Atlas long-range missile was launched from Cape Canaveral in late November 1958. In August 1959, a Thor Able missile was used to successfully launch Explorer 6, the first U.S. satellite to transmit pictures of the earth taken while in earth orbit. On the west coast of the U.S., the USAF responded immediately to the "Sputnik Crisis" as it was called. The Soviet Sputnik launch had clear and definitive military implications and the Air Force rushed to get their military programs into high gear. On October 4, 1958, Cooke AFB (formerly Camp Cooke) was renamed Vandenberg Air Force Base. The transition from army base to missile base was realized in December 1958, when a Thor Intermediate Range Ballistic Missile (IRBM) was launched from Vandenberg. In early 1959, the U.S. Army team of former V-2 rocket experts relocated in Huntsville and working under the direction of Wernher von Braun, were transferred to NASA. Over the next several years this group worked feverishly to develop the plans and designs for the hardware and software that eventually led to the Saturn series of rockets launched in the 1960s. From a military point of view the Cold War expanded overnight into both a nuclear "Arms Race" and a "Space Race", causing the developmental pace of both intermediate and long range missile programs" to be further accelerated. In late 1959, the first Atlas D ICBM was launched from Vandenberg and Jupiter IRBMs were deployed operationally to "hot spots" around the world. Throughout the 1950s and early 1960s, missile tracking ships and Polaris submarines, intent on providing support to long range missile testing became a common sight in the harbor at Cape Canaveral. From the early Cold War days of the 1950s, it was difficult for the average U.S. layman to understand the apparent lack of coordination and teamwork and the competition that existed between branches of the military and other U.S. civilian agencies. As time passed, the problem became even greater with the expansion of the NASA and other scientific communities while the security of the U.S. was being seriously threatened by other factions of the outside world. In 1958, NASA faced numerous challenges. How should space activity priorities be established and implemented? Should scientific requirements take precedence over those of the engineering, military and political communities? Should the exploration of space involve men or robotics or both and should the use of robotics take precedence over manned space operations? NASA and their contractors were now responsible to respond to each of the space oriented open concerns and to identify and develop a long range manned and unmanned space program that would satisfy its' primary objectives. The expansion of the Cold War and the Space Race that occurred throughout the mid-late 1950s into the 1960s had a far reaching impact on the Gemini and Apollo projects and on other projected U.S. space programs.

NASA Ten-Year Plan, 1960-1970

In late 1959, while studying the possibility of follow-on programs to Mercury, the Research Steering Committee for Manned Flight released the first NASA Long Range Program Plan for the years 1960-1970. Inputs to the plan came from Harry Goett and his Space Science Board, the Jet Propulsion Laboratory (JPL) and from Wehner von Braun and the Army Ballistic Missile Agency (ABMA). The Long Range Plan, developed and endorsed by the NASA Research Steering Committee and released in late 1959 was revealed to the Congress in January 1960. The manned program destined to follow Project Mercury at that time was conceived to be primarily an earth orbital program with some application to planetary "reconnaissance" and, subsequently, to lunar exploration. The Ten-Year Plan provided for a rapidly expanding program on a broad front: manned flight (first orbital, then circumlunar); scientific satellites to measure radiation and other features of the near-space environment; lunar probes to measure the lunar space environment and to photograph the moon; planetary probes to measure and to photograph Mars and Venus; weather satellites to improve our knowledge of Earth's broad weather patterns; continued aeronautical research and continued development of larger launch vehicles for lifting heavier payloads. The cost of the program was expected to vary between $1 billion and $1.5 billion per year over the 10-year period. It called for over 250 launches during the next decade, and a manned flight to the moon after 1970.

Apollo Spacecraft/Launch Vehicle Contract Release

On July 28, 1960, at a NASA Industry Program Plans Conference in Washington, D.C., George Low revealed a new manned spaceflight program called Apollo. The program was still under study and no official government approval for it had yet been given. Like Mercury, Apollo was named after a Greek God. The Apollo study plan that was discussed at the conference reflected the launch of three astronauts into a sustained orbit, or into an orbit around the moon. The timing of the announcement was not especially wise. Over the next 4 months, NASA experienced Project Mercury launch failures on three vehicles: MA-1, MR-1

and Little Joe-5. These disasters ushered in a bleak period for the Mercury test project and marked a low point in morale for the personnel working on the project. In August 1960, the Goddard Space Flight Center (GSFC) management, home of the NASA Space Task Group (STG) at that time, hosted an industry-wide briefing that discussed the release of a feasibility study proposal for the Apollo spacecraft as a prelude to the release of a proposal request for its development. The feasibility study was completed by the aerospace industry in early May 1961. With that data in hand, a NASA STG special committee, under the direction of George Low, then in charge of human space flight at NASA Headquarters, conducted a detailed technical and cost evaluation of the study results preparatory to the release of a formal proposal request. In late July 1961, NAA was notified that it was one of twelve contractors invited to submit bids for the development of the Apollo spacecraft and that proposals were due to NASA by October 9, 1961. In the late 1950s political issues between the scientists and advocates of manned space flight, some of which exist today, became interspersed across the space program. Although not a direct issue in the up-coming presidential campaign, the space program found little reassurance of its priority as an expensive new item in the federal budget.

Apollo Program Pre-Planning

During the late 1950s and early 1960s the Apollo program was conceived, developed and implemented with the goal of landing a human on the moon, to carry out a program of scientific exploration of the moon and to achieve superiority in space. Contracts were released to the aerospace industry for the acquisition of each of the major elements of flight and ground system hardware and software that would be needed to ensure that we would be able to meet our goals in space as directed by the Space Act of 1958. On November 28, 1961, North American Aviation, Inc. was selected as the principal contractor for the Apollo Spacecraft under NASA Manned Spacecraft Center (MSC) direction. On October 30, 1962, NASA Marshall Space Flight Center (MSFC) signed a contract with NAA for the development and production of the S-II Second Stage of the Saturn C-5 vehicle. Upon receipt of these contracts, NAA was in a position to lead a major design support effort for the NASA to meet the national space related goals. After the Apollo Program was chartered in the early 1960s, it became evident that a follow-on project to Mercury would be essential. The purpose of the new project would be to demonstrate the endurance of humans in space while developing rendezvous, docking and extra vehicular activity techniques in a zero-g environment. With that understanding, a decision was made that the two-man Mark II Project would become the Gemini (in Latin means twins) Project and that the Apollo Program would become the lunar landing program. John F. Kennedy, the 35th President of the United States and his Vice President Lyndon B. Johnson assumed their new roles and responsibilities in late January 1961. At that time, their slogan was *"Let's get this country moving again"*. On May 25, 1961, the President announced, before a special joint session of Congress, the dramatic and ambitious goal of sending an American safely to the moon before the end of the decade. At that time Kennedy felt enormous pressure to have the United States catch up and overtake the Soviet Union in the "Space Race".

Brief Summary Apollo Unmanned Launch Program

In mid-1961, NASA declared LC-34 ready at Cape Canaveral to support Saturn I launches. Later in the year, it was announced that the Kennedy Space Center (KSC) would be the home of the Apollo launch site and that they would process flight hardware utilizing a new mobile launch concept. Later in the year, the U.S. Congress authorized NASA to acquire land on Merritt Island, Florida, that would supplement needs already identified and would become the future site of all U.S. civilian spacecraft launches. NASA also made the decision that the permanent location of the Manned Spacecraft Center would be in Clearlake, Texas. MSC became the home of the Mission Control Center (MCC), the location from which control and monitor of all U.S. civilian manned space flights would eventually originate and the home and training facilities of the astronaut corps. Between May 1961 and May 1963, there were six successful Mercury launches and flights from Cape Canaveral. In early 1962, the identification of a new management structure that clarified the organizational interfaces and responsibilities between each of the NASA centers and the Air Force were verified. The key programmatic decision made in 1962 was the identification of the Lunar Orbit Rendezvous approach technique to be utilized to access and to land on the moon. With that decision made, the design of the overall Apollo vehicle stack and landing configuration of the flight vehicle and its associated ground systems was able to proceed. With a rudimentary understanding in late 1962 of the lunar flight configuration that would be processed at the launch site, KSC proceeded with the design of their ground systems. Many of us still remember the build-up of thousands of armed U.S. troops along the Florida coastline in late 1962 at the time of the Cuban Missile Crisis. Those of us who lived close to Patrick AFB will remember the whining sound of the USAF U-2 aircraft as they exited from and returned to Patrick upon completion of their missions over Cuba to the south. By early 1963, development contracts had been released by NASA to the giants of U.S. industry (Boeing, Douglas, IBM, Grumman and NAA) to design and build the various stages of the Saturn V launch vehicle, its rocket engines, and the spacecraft that would take us to the moon. By mid-1963, NASA had four successful Saturn I launches from LC-34 at Cape Canaveral under their belts and plans to launch six additional flights from LC-37B into 1965. Beginning in late 1963, in excess of four years of manpower intensive effort and $800 million were planned for expenditure in the design and construction of Launch Complex 39 and the associated Industrial Areas on Merritt Island at KSC. While design and construction of the Merritt Island LC-39 and Industrial Area facilities were being worked, rocket launch history was being established at WSMR and at Cape Canaveral. Six manned Mercury missions were launched from Cape Canaveral and successfully recovered before the project was terminated in mid-May 1963. Project Mercury accomplished the goal of placing a human (John Glenn) in orbit around the earth, and laid the groundwork for Project Gemini. Abort testing at WSMR, supported by many of us from the Cape, was initiated in late 1963 and successfully completed in January 1966. The Apollo Abort test program proved the capability of the CM to safely escape an emergency condition either on the launch pad or during the early stages of flight then to land successfully by parachute. Ten manned Gemini mis-

sions were successfully launched from Cape Canaveral between early March 1965 and November 1966. The Gemini Project built upon the successes of Mercury while processing a slightly larger spacecraft that carried two astronauts into space. Gemini demonstrated that both humans and equipment could survive a space capsule environment for extended periods of time. The Gemini astronauts proved that they could perform Extra Vehicular Activities (spacewalk), maneuver the Gemini capsule in space using small rocket engines and rendezvous and dock with another space vehicle. In the mid-sixties the performance of Gemini established a new technical and operational base from which we could depart to the manned Apollo program. Of significance was the successful launch from LC-37B into orbit and recovery of two Apollo boilerplates, CSM-013 and CSM-015 on the sixth and seventh Saturn I flights. These flights proved the compatibility of the Saturn I and the Apollo Command/Service Module (CSM), active Launch Escape System, and the Spacecraft Launch Vehicle Adapter (SLA). In 1963, an Apollo program goal introduced during the Saturn I series of test flights was to design the flight system to accommodate the maximum amount of flight testing while utilizing the minimum number of launches and consequently less hardware, resulting in lower cost. The concept, referred to as "all up" testing was promoted by Dr. George Mueller and after much debate was accepted totally by all elements of the program. This concept provided a significant departure from the methodical (component through stage) test build-up approach previously used on launch vehicles. This philosophy change on the program is believed by many to have provided us with the additional schedule time needed to ensure a landing on the moon in 1969. In late 1963, before the untimely death of President Kennedy, he proposed before the United Nations General Assembly that the U.S. and the Soviet Union join forces in their efforts to reach the moon. It is believed that Nikita Khrushchev was poised to accept Kennedy's proposal at the time of his assassination. Three unmanned Saturn IB sub-orbital test flights conducted during 1966 proved the operation and compatibility of the Saturn IB rocket, the new S-IVB stage and the Apollo CSM spacecraft. Late in January 1967, the tragic Apollo 1 fire discussed in great detail in previous articles brought the program to its knees and aborted the planned first manned Apollo Program launch for 18 months.

Much of the previous discussion has revolved around the performance of the hardware and software designs, development processes, and the manufacturing and test operations of each of the supporting contractors. Each of the articles has been devoted to a review of the projected flight and ground system flight objectives and developmental history of each unmanned Saturn/Apollo flight vehicle. Much emphasis has been specifically devoted to the performance of the Apollo ground and flight system hardware and on the development of the launch team during the initial years of the unmanned program. Based on the "lessons learned" and experience gained in those early "unmanned" years both in the factory and at KSC, significant "learning curve", improvements were incorporated into the manned Saturn V program by a highly motivated, success oriented work force. As a consequence, Saturn V hardware deliveries to KSC from the manufacturing locations were accelerated to support the manned program. Changes to the KSC Saturn V operational build-up sequences were incorporated into our launch processing schedules. As we entered the manned Apollo spacecraft era in 1968, there were two years remaining in our commitment to a manned lunar landing prior to the end of the decade. Upon successful completion of each of the U.S. unmanned flight test programs they were followed by a period of manned flight operations of each applicable space program. In order to provide the reader with a better understanding and historical perspective of the U.S. space programs of that era, my articles discuss the magnitude of the total task that we, NAA, undertook as well as that for which other contractors and our NASA customer were responsible. In each of the articles I have also attempted to specifically identify our authority and responsibility throughout the 1960s and early 1970s as we provided leadership, ingenuity and support to the Apollo Program and to the Skylab and the Apollo-Soyuz Test Project.

"The American, by nature, is optimistic. He is experimental, an inventor and a builder who builds best when called upon to build greatly."

— John F. Kennedy

Accounting of North American Aviation Memorial Bench Project Funds and Update

by Ed Rusinek

Total Funds remaining from previous fund drive for two Memorial Benches $3,297.05

List of New Donors for NAA Memorial Bench at KSC

Name	City	Division Affilliation	Rememberance
Olive Houston	Santa Maria, CA	Autonetics	In Loving Memory of my Husband, Bennie Houston of Autonetics
Mike Mathews	Palm Desert, CA	LAD	
James Albaugh	Seattle, WA	Boeing Commercial Airplanes	In Memory of the Rocketdyne Turbo Machinery Group
Charles Kelch	Laughlin, NV	LAD	
Richard Acton	McClean, VA	S&ISD	In Loving Memory of my Wife, Kathleen Acton of Corporate

Total Funds Available $3,642.05

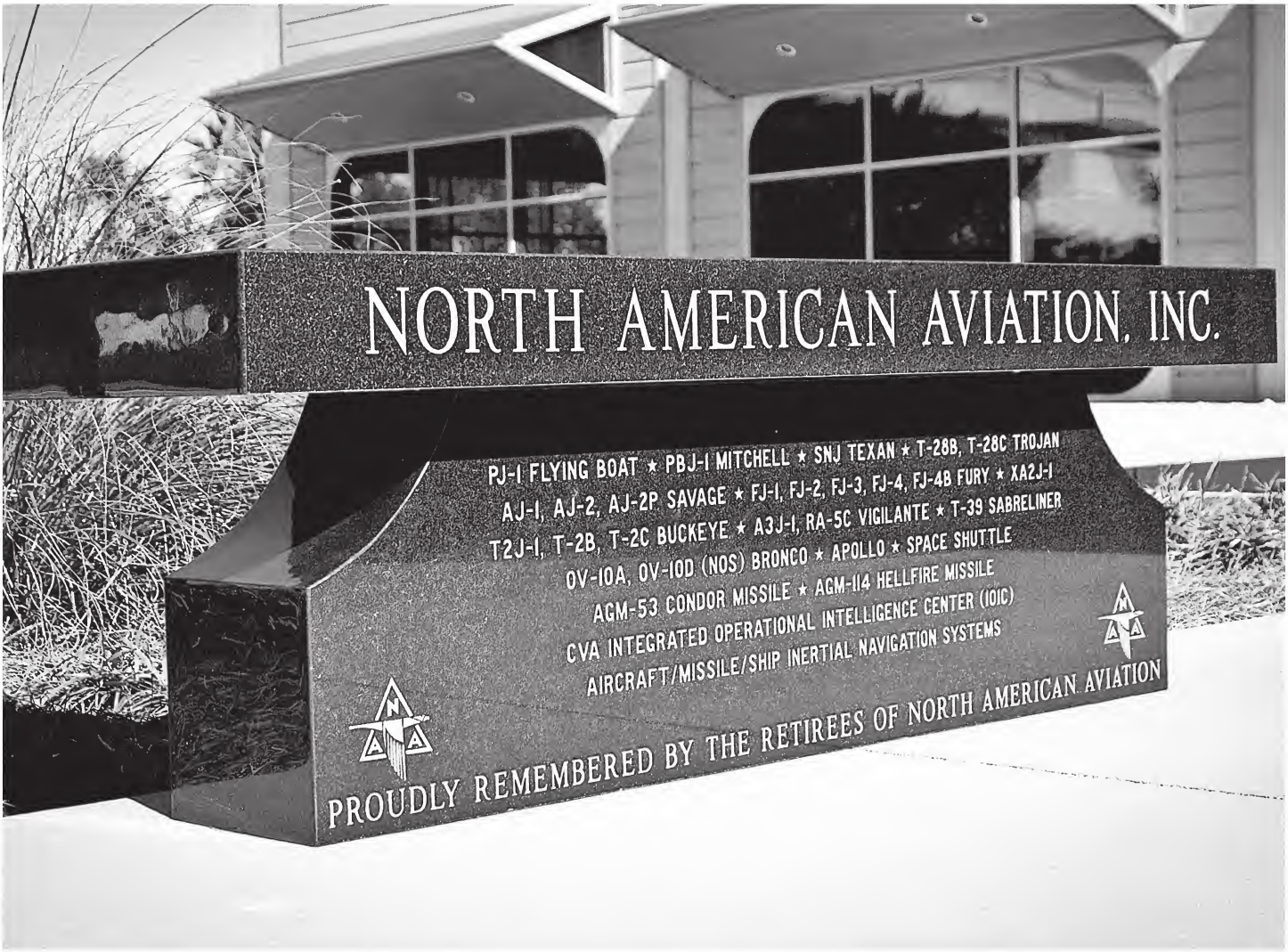


Photo courtesy of Capt. Ed Ellis, via Capt. Jim Shaw

The second North American Aviation Memorial Bench was delivered and installed in a prominent location on the grounds of the National Naval Aviation Museum at NAS Pensacola, Florida. Thanks to you, the Memorial Benches comemmorate the many contributions of NAA to the nation's Defense and Space Programs.

President George H.W. Bush
Honorary Chairman of the Board

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NAVAL AVIATION MUSEUM
FOUNDATION

January 24, 2014

Mr. Nolan Leatherman

Dear Nolan,

I am pleased to report that the beautiful bench seat donated by the North American Aviation Retirees is now in place at the main entrance of the National Flight Academy on the grounds of the National Naval Aviation Museum here in Pensacola, Florida.

Having North American Aviation recognized here at the Museum is important because of the many contributions North American Aviation made to Naval Aviation. Here at our Museum we have the NAA PBJ (Mitchell B-25), made famous by Jimmy Doolittle for its flight from the USS Hornet for the first bombing attack on the Japanese mainland during WW II. The SNJ Texan trained more fledgling Naval Aviators than any other aircraft. The Navy FJ (F-86) series of aircraft produced by North American are on proud display here as well as the AJ Savage. The A-5 Vigilante was a mainstay in the nuclear delivery program and later as a reconnaissance aircraft as the RA-5C. The T-28 Trojan trained most of the Naval Aviators that flew in Viet Nam and the OV-10 was famous as a light attack aircraft flown by the "Black Ponies" of HAL-4 as the only shore based Navy Attack Squadron in Viet Nam.

As you can see, the North American Aviation association with the Navy has been superb; North American Aviation aircraft have trained thousands of Naval Aviators and have carried thousands more into combat for our country. The North American Aviation Retirees have a right to be very proud of the many contributions they have made to our nation and to Naval Aviation. I want to personally thank you and the members of your association that enabled this bench to be placed on display here in Pensacola. It is a fitting tribute to North American Aviation and the many dedicated employees that produced such fine aircraft.

Sincerely,

Duane D. Thiessen
Lieutenant General, USMC (Ret)
President and CEO

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NAS Pensacola, FL 32508-3104
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"To Inspire, Engage and Educate"

NAA and the Early Development of Hellfire

by John J. Garvey, Jr.

The HELLFIRE (Heliborne Laser Fire and Forget) missile is getting a lot of press these days because of its use as a terrorist killer fired from drone aircraft, especially the Predator. "AGM-114" is the official DoD designator for HELLFIRE. You will find reasonably good descriptions of the missile HELLFIRE II, as well as some of its history beginning with the formal Engineering Development Program started in 1976. What is missing from this story is the major part played by NAA's Columbus Aircraft Division (CAD), Columbus Missile Systems Division (MSD) and Autonetics Strategic Systems Division.

Background

The need for a larger diameter, longer range, launch and leave, anti-tank helicopter-fired missile came from improvements in both Soviet tank armor and Soviet Air Defense systems. And the most important of the enabling technologies was the development of semi-active laser weapon guidance. These eventually led to the U.S. Army's Operational Requirement for a Helicopter-Launched, Laser-Guided, Fire and Forget anti-tank missile.

U.S. Army Operational Requirements

The threat posed in the early 1970s by massed USSR tanks poised to invade our NATO allies presented several operational problems for the U.S. Army. The AH-1G Cobra helicopters were armed with 2.75" rockets and Tube-launched, Optically tracked, Wire-Guided (TOW) missiles. The TOW was used extensively in Vietnam but had some operational limitations which caused the Army to look for other solutions. The maximum launch range for TOW was limited by the length of the wire along which the guidance commands were sent and the 5-inch missile diameter limited warhead size and the kill effectiveness of the weapon against the T-64 and T-72 heavily armored Russian tanks. In 1962, the USSR began deploying the mobile ZSU-23-4 radar controlled anti-aircraft gun system which had an effective range of 3,000 meters matching the TOW wire length. And after launching the TOW, the attacking helicopter had to remain exposed in order to maintain line of sight to the target to guide the TOW to impact, making it very vulnerable to the ZSU-23-4.

Laser Guidance Technology

In 1960, the laser was invented at Hughes Aircraft Company and in a few years, Dave Salonimer of the U.S. Army Missile Command (MICOM) at Huntsville, Alabama theorized and showed analytically that terminal guidance could be accomplished using a laser designator pulsed at a frequency (prf) in the range of 10-20 pulses per second (pps) and pulse widths of 15-20 nanoseconds. On this basis, the MICOM established the Laser Missile Systems Branch in late 1966 and initiated a program to demonstrate the terminal accuracy of this guidance concept culminating with missile flight tests. In the years following, Hughes developed the Ground Laser Locator Designator (GLLD) which operated at a wavelength of 1.06 nanometers (nm), and Martin Marietta Corporation developed the Cannon-Launched Guided Projectile (CLGP) to be used in conjunction with the GLLD. The terminal accuracy of what had previously been "area" weapons (bombs, projectiles) was improved so that their effectiveness more than justified the cost of designators and missile guidance and control systems.

NAA Role in HELLFIRE Development

In 1969, CAD found itself positioned to play a leading role in the MICOM demonstration program and the early phases of development of the solution to these emerging Army operational requirements. CAD Missiles group had already developed a missile design which could be modified and proposed as the test vehicle for the demonstration. The existence of this missile, the USAF Hornet, coupled with a commitment to the program by MSD management, put MSD in position to be the prime contender for development of the AGM-114.

USAF Hornet Missile

In 1962, CAD was awarded a contract by the USAF to study the feasibility of an air-to-surface missile launched from a high speed aircraft using a gimbaled television camera with seeker electronics to guide the missile to a stationary or moving ground target. In the ATGAR (Anti-Tank Guided Aircraft Rocket) concept, the Weapon System Operator (WSO) found the target using a cockpit display of the image from the missile's TV sensor, locked the seeker onto the target, and launched the weapon allowing the aircraft to engage other targets or leave the area. At the completion of this study in 1961, CAD was awarded a follow-on Contract AF08 (635-3074) to conduct a test of a TV seeker located on a tower against moving tank targets at Ft. Knox, Kentucky in 1963. These tests were successful and, in 1964, CAD was awarded Contract AF08 (635-4233) by the USAF Armament Division at Eglin AFB, Florida to Design, Develop and Demonstrate the complete missile system.

The Hornet was CAD's first foray into designing and developing an air-launched tactical missile for any Customer. The MQM-42A Redhead/Roadrunner was a ground-launched target missile which CAD was developing for the U.S. Army MICOM during the same time period (see the Fall 2013 Retirees Bulletin). For the record: Pete Vrona, who was the Redhead/Roadrunner Project Engineer, tells me that, although thrust misalignment was thought to be the cause of the flight control problems, the stability problem was actually in the Flight Control System. The Autopilot was modified by adding gyros as a result of recommendations by Bob Emmert and this ultimately solved the flight problems. The Hornet was a 7" diameter missile, weighing about 125 pounds, and had its aerodynamic surfaces arranged in the + (plus) configuration. In addition to the TV Seeker, it had a very short duration (0.2 sec) solid propellant rocket motor, two rate gyros and a roll displacement gyro with an analog autopilot for stabilization, a nitrogen gas-powered pneumatic actuation system, and a telemetry package that was located in the space behind the seeker reserved for the warhead.

The Hornet project team consisted of Dick Gast as the Project Manager, Ken Evans as the Project Engineer, Ike Thomas (Guidance and Control and Electrical Systems), Frank Decaminada (Mechanical Systems), Frank Nelson (Mechanical Design), Paul Capcara (Control System Design Manager), Bill Daniels (Autopilot Electronics Design), Elmer Hilburger (Actuation System Design), Joe Creek (Gyros and Flight Control System Design), Cliff Tefand (Aero Design Manager), Ralph Barnes (Aerodynamics), Carl Bates (Systems Analysis), Joe O'Neil

(GE Spin-stabilized Sensor Platform), Dick Egbert (Electronics Design Manager), Bill Parker, Duane Hartman, Neil Deye, George Lembke, Dick Kuhn and others (Electronics Design – Camera/Tracker/Power Subsystems), Bud Johns (Platform Electronics), Ray Gallagher (Tracker Requirements and Analysis), Dick "Gibby" Gibson, and many others. During this time period, the U.S. Navy at China Lake was developing the air-launched Walleye missile for ship attack using TV tracking technology. The China Lake technical staff informally mentored the CAD Hornet team in the basics of TV tracker guidance. Under the 1964 Eglin contract, a captive flight test of the seeker in a pod was successfully conducted. However, at missile launch, a seeker tracker "break-lock" problem was discovered related to nutation of the platform's spinning mass during launch acceleration. This problem was solved by adding a patented nutation damper invented by T.J. "Bud" Johns. A large electrical transient during launch power transfer was also discovered. That problem was fixed by implementing a decrease in seeker tracking loop sensitivity also suggested by Bud. The problems were investigated and the solutions tested using an innovative "launch and catch" facility designed by CAD and built at Eglin. In 1965, the Hornet (XAGM-64A) achieved its first successful hit on a ground target after launch from an F-100 with NAA's John Dickason as the WSO. In spite of a series of successful hits on stationary and moving targets, the USAF stopped work on Hornet and decided instead to fund development of the larger diameter Maverick missile (AGM-65). The Hornet program was not only a starting point for HELLFIRE but also for the 1967 USAF Homing Bomb System (HOBOS) which included the GBU-8, GBU-9 and eventually the GBU-15. These bomb kits utilized the same Flight Control System architecture, spin-stabilized platform and TV tracker technology first used in Hornet. MSD also leveraged the Hornet TV guidance experience in developing the Condor missile for the U.S. Navy beginning in July 1966. Condor was an air-launched long range standoff weapon using a secure data link between missile and aircraft which was demonstrated in a number of successful launches against both land and ship targets. However, the Navy elected to deploy the Harpoon missile instead of Condor because of the Harpoon's all-weather launch-and-leave capability using autonomous radar guidance.

Terminal Homing Flight Test Vehicle (THFTV)

Early in 1970, as the next phase of its Laser Terminal Homing demonstration program, MICOM issued RFQ DAA H01-70-Q-0310 to "Design, Fabricate, Test and Deliver Terminal Homing Flight Test Vehicles". This was a competitive procurement and the project team of Bill Laymon as Program Manager, Bill Bickel as Project Engineer and a number of technical staff created a 7-inch missile design based on the USAF Hornet and submitted the proposal in June 1970. The proposed structural modifications to Hornet included reducing the wingspan, increasing the thrust profile of the rocket motor (for low-speed helicopter launches) and flying the missile in the "X" configuration for launch compatibility with the UH-1 test helicopter. In addition, the autopilot was redesigned for compatibility with the laser seeker and the modifications necessary to accommodate the changes in the aerodynamics. The proportional navigation guidance law, roll axis stabilization and g-bias elements of the Hornet flight control scheme were maintained (as they were throughout the HELLFIRE missile development). Carl Bates led the guidance and control analysis effort and Bill Daniels worked the autopilot electronics redesign and development with Bill Arnold. The THFTV team also included a propulsion engineer, Hi Cox; telemetry engineer, Al Leach; Digital and Hybrid simulations engineers, including Larry Nuzum and Bob Bensinger; aerodynamicists Ralph Barnes and Phil Monzo; and many others, some of whom are pictured in THFTV/T-6 Team photo. Ralph Autery was our system integrationist, stationed on-site at MICOM. The first



(Photo MSD 1972)

THFTV and T-6 Missiles Team Members – Standing (from the left): Jack White, unidentified Team Member, Hi Cox, John Belcher, Ralph Autery, John Loudner, Bill Laymon, Al Lawrence, Larry Nuzum, Bill Bickel, John Garvey, Dr. Jim Reagan, Rodell Lawrence, Charlie Shoemaker, Gil Lester, Ned Dumond, Moose Elke, Ralph Hoffman, and Bob Raugh. Kneeling (from the left): Bob Izzard, Roger Warren, Phil Monzo, and Mike Carroll.

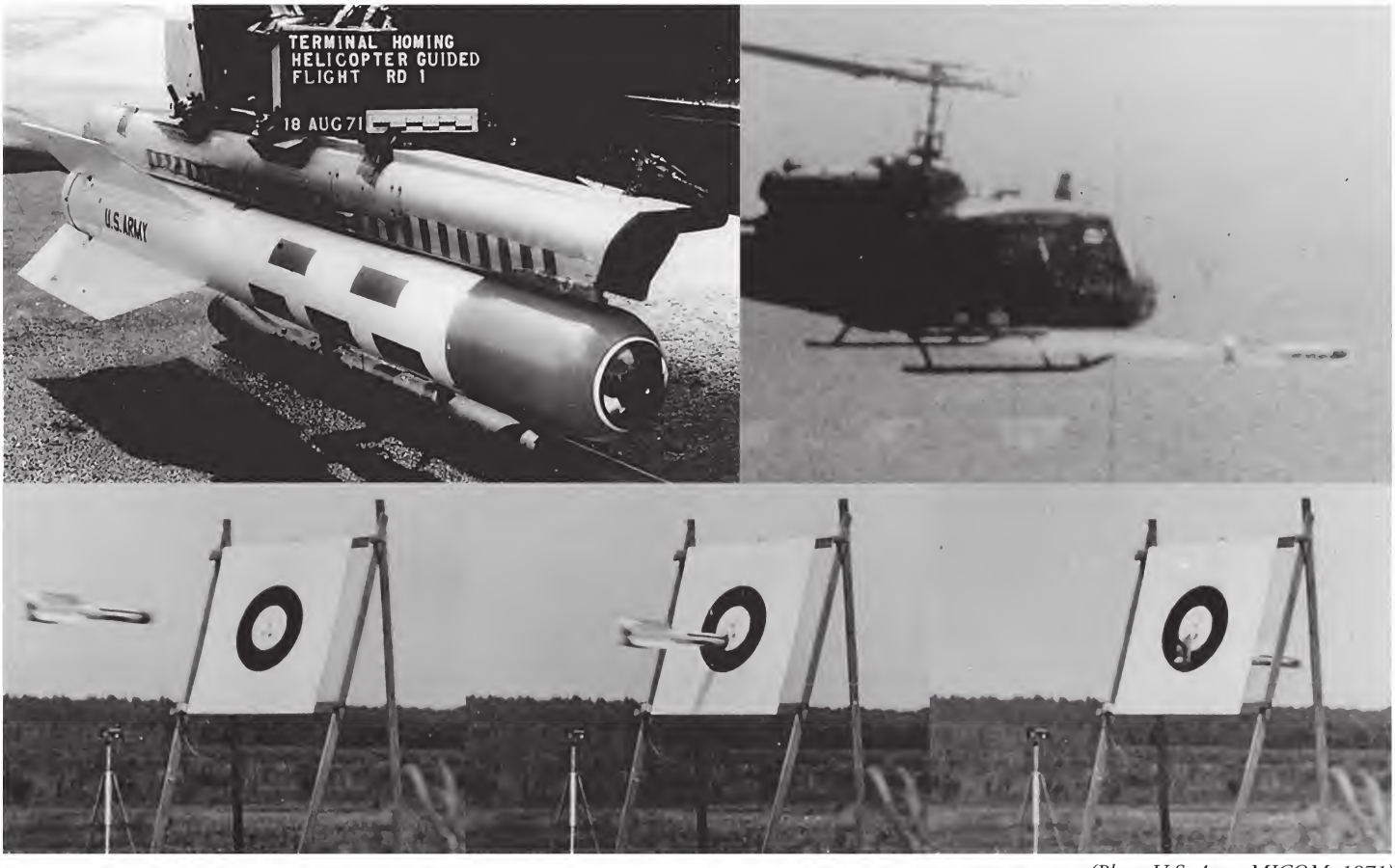
two THFTVs were delivered by van to MICOM in January 1971 by Bill Bickel and Ralph Autery. And by July 31, 1971, a total of 48 test vehicles were delivered, including 6 for jettison testing and 5 for separation testing. Of the remaining 37 missiles, 25 were integrated with rocket motors and laser seekers for launches from a tower and eventually from a UH-1 helicopter. 24 of the 25 guided launches scored direct hits on the target. One miss, a night launch, was attributed to laser operator error. The remaining THFTV missiles were used by MICOM to test other seeker candidates. In 1972, Col. R.L. Parnell, Jr., USMC (Ret) joined the team and remained the MSD HELLFIRE Program Manager into the start of the Engineering Development Program.

In parallel with the THFTV program, NAA's Autonetics Division was awarded a MICOM contract to modify Sidewinder missile (AIM-9) Infrared (IR) seekers so they could sense laser energy in a Narrow Field of View (NFOV) and provide the appropriate guidance output signals to achieve terminal homing with the THFTV. Bob Godwin and Bruce Fowler were part of the Autonetics management team and Ken Corbett was the project engineer for these seekers. A few of the THFTV launches included a Wide FOV laser seeker provided by Autonetics with Don Hockensmith as the seeker project engineer. During the next 5 years, over 40 laser seekers were delivered for test launches at MICOM in support of three separate flight test demonstration phases. The small CEP around the center of the laser spot on the target proved beyond any doubt that the concept was feasible.

Missile Systems had separated from Aircraft in 1965 and, in March of 1972, Missiles became a fully chartered division of North American Rockwell. For most of the early HELLFIRE development, Dr. Jim Reagan was Missiles' General Manager, Bill Steber the Chief Engineer, and Jim Overbey the Manager of Advanced Engineering, where all the early proposals and analyses were prepared. Although we were a separate corporate entity, every missile delivered by MSD to MICOM contained a substantial number of structural components fabricated within the shop at CAD. Charlie Shoemaker was our liaison with the CAD Shops department and he epitomized the spirit of cooperation that existed and continued through the ED program. MSD also was fortunate to have the services of Max Breene of CAD's Quality Engineering staff to help balance the programs' delivery requirements with the need for a quality product. Furthermore, CAD's facilities, including environmental test chambers and structural test equipment, digital and analog computer resources, and flight simulator were used extensively during the entire development of THFTV, T-6 and HELLFIRE. Bob Wyne, the NAR marketing representative in Huntsville, provided constant coordination among the two primary NAR Divisions and the MICOM management and technical staff during all of the HELLFIRE-related programs.

Terminal Homing Accuracy Demonstration (THAD) Missile

In addition to the THFTV, the Team Member photo below also shows the 6" diameter Terminal Homing Accuracy Demonstration (THAD) missile (also called the "T-6") designed and developed by MSD in response to an Army desire to reduce the missile diameter (and carriage weight). This reduction was possible based on test results of a 6" diameter shaped charge warhead's



(Photo U.S. Army MICOM, 1971)

THFTV Flight Test 1 – installation and launch from the UH-1 helicopter and sequence of a direct hit on the target.

effectiveness against the latest postulated Russian tank armor. Based again on the efforts of Bill Laymon and Bill Bickel, MSD received a contract in 1972 from MICOM to deliver 17 sets of Autopilot Parts to be integrated at MICOM with Autonetics Army Laser Seekers (ALS) and Government-provided TM sections and Thiokol Rocket Motors. The T-6 development team retained many of the THFTV team members but added Ralph Hoffman for Autopilot Electronics, Ned Dumond and Mike Carroll for Thick Film Electronics Board Fabrication, Herm Enterline for System Integration and Bob Emmert for Flight Control System. There were a number of innovations in this design including autopilot electronics using thick film technology, non-metallic wings, strakes, launch shoes, brackets and fairings, ribbon wire harnesses and TOW Missile two-axes gas-fired displacement gyros to reduce costs. The 70 lb T-6 missile employed a low-aspect wing design (11" span) and could accommodate a range of seeker lengths and weights by using seeker-specific forward strakes. The missile could be launched in either a direct fire lock-on-before-launch (LOBL) mode or an indirect lock-on-after-launch (LOAL) mode. In LOAL, the T-6 was ground launched at a moderate elevation angle and gradually pitched over to allow the target to enter the seeker's FOV. At target lock-on, the pitch-over bias was removed. The successful tower and helicopter launches of the T-6 continued to demonstrate the CEP achieved during the THFTV program, although considerable effort was required to resolve noise saturation problems arising from the use of the TOW wire-wound gyro potentiometers and T-6 autopilot filter networks. This finally resulted in the use of film-deposited potentiometers for the gyros.

Laser HELLFIRE Operational and Technical Test (LHOTT) Program

In March 1974, MSD was awarded a contract by MICOM to outfit seven AH-1G Cobra helicopters with HELLFIRE-specific fire control electronics identified as Remote HELLFIRE Electronics (RHE); seventeen 3-rail Launchers, each with Missile Control Electronics; 10 6-inch Training Missiles (Captive carry missiles with operational Army Laser Seekers); 18 Dummy (inert) Missiles; and representative missile shipping containers for the entire missile inventory. We had an incredibly short 5 month delivery time schedule. The key LHOTT project staff were Bob Eisminger, Program Office; John McCullum, Fire Control and Helicopter Integration; Ernie Stoops, Multi-rail Launcher; and Bob Izzard,Test and Field Support Equipment. CAD provided engineering support in the structural design of the launcher and LAD supported that design effort with quick turn-around computer simulations. John Longo, Electronics Manager; Ron Hickson, Duane Hartman, Dick Witham, John Laboski, Paul Emmert, Mike Weir, Warren 'Moose' Elke and many others provided the electronics and mechanical design and development support. MSD also provided on-site field support to the Army including Training, Maintenance and spares for Level 1 maintenance functions. These assets were used to test ground support operations (reload times and Mean-Time-To-Repair estimates), mission operational options (direct & indirect fire) and mission effectiveness (System Reliability and instrumented force-on-force trials). These tests, conducted at Fort Hunter-Liggett in central California, resulted in the decimation of the "Red" force and showed conclusively that the system would meet all Army requirements.



(Photo U.S. Army MSD, 1975)

LHOTT Team with an AH-1G Cobra: (standing from the left) Frank Kohler, Mike Falco, Bob Knight, Chuck Bishof, Ron Hickson, John Strang, Mike Cleer, Art Hoadly, Jack Riehle – Co-pilot), Tom Moore, Art Kendall, Wes Lamboley, Gunnar Shalene – Pilot, Jerry Stedman, Dick Morris, Dick Whitham, John McCullum, Mike Weir, and Larry Ault with Bob Eisminger (kneeling).

HELLFIRE Modular Missile System (HMMS) Advanced Development

In June 1974, MSD won a contract to conduct the formal Advanced Development Program for the HMMS. The proposed missile design was based on the T-6 and used the LHOTT experience in designing and developing the Fire Control electronics, launcher electronics and structure, and support equipment. This contract also included the initial efforts on all the "-ilities": Reliability, Availability, Maintainability, Durability, Producibility and Design-to-Cost estimates for specified missile delivery quantities and schedule. Some producibility improvements were included in these missiles, the most significant of which was the non-metallic actuation system incorporating compression-molded phenolic body and piston components. John Brubaker, Ross Lamb and Jim Schwickert had worked on IR&D funding to develop the non-metallic actuator to the point that we could incorporate it in the AD program. In addition, the launch shoes and umbilical connection were made compatible with the LHOTT launcher rail. The AD missile launches, conducted at MICOM, continued to demonstrate the low CEP but there were some flight path irregularities. Studies focused on launch transients induced by launcher hold-back mechanism forces and rocket motor thrust misalignments. Neither of these proved to be the cause. In early 1976, Dr. Larry Stockum uncovered the presence of a mechanical deadband in the flap position of the non-metallic actuation system beyond the feedback signal from the potentiometer. With the problem identified and a fix incorporated, the final T-6 missile flight in the late spring of 1976 demonstrated textbook flight path performance just in time for the submittal of the HELLFIRE Engineering Development proposal. The LHOTT and the T-6 teams contributed significantly to this proposal and formed the nucleus of the Engineering Development team.

Just prior to the submittal of the ED proposal, MICOM funded MSD to conduct an expedited study to compare the differences in cost and performance for a 6-inch dia. Laser beam-rider missile, and 7- and 8-inch diameter Laser-guided missile design variants. The estimates of the armor protection capability on the new Soviet T-80 tank necessitated this study. Ernie Stoops led this very short turn-around effort to assist the Army in selecting the final missile diameter requirement (7 inches, driven by the warhead diameter requirements) for the production HELLFIRE.

HMMS Engineering Development

In my opinion, the primary reasons that MSD prevailed over Hughes Aircraft Company in winning the ED contract were: 1) An extremely close working relationship between the MSD and MICOM technical and management teams had developed over a six-year period; 2) A demonstrated commitment by MSD and NAR management to support the Army in the HELLFIRE program with marketing and R&D resources; and 3) A superior technical effort produced by a relatively small group of dedicated engineers, technicians and support staff.

About the author: John Garvey served as THFTV System Engineer, T-6 Missile Project Engineer, and HELLFIRE Systems Engineering Manager during ED. He did not join MSD until mid-1966, well after the Hornet program was underway. Thanks to all who contributed, but especially to Bill Bickel, Joe Creek, Bill Daniels, John Dickason, Bob Emmert, Ralph Hoffman, Bud Johns, Ernie Stoops and John McCullum for their inputs.

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Welcome all! Past & Present Employees and Friends of NAA, Rockwell, Boeing
Doors Open for Social at 10:00AM, Seating at 11:00AM, Lunch starts at 12:00 Noon
Register Early! **Table seating will be assigned to pre-paid guests on first-come basis**
Prefer to reserve a table? Organize a group of 4 to 8 and order tickets in one check

Contrails From The Past

by Ed Rusinek

Dear Ed,

In 1967, Autonetics Data Systems Division reorganized and I was transferred to a small engineering group designing disc memories for the Minutemen missiles. I worked for Larry Buff and shared an office with Theodore H. "Ted" Laban. During the day a young man would come into our office and talk to Ted in what I correctly guessed was Russian. When I asked Ted where he learned Russian, he told me, *"Russia"*.

Over a few days, he related to me how he had been interned in Russia for three years during WWII. He was the flight engineer on one of Doolittle's B-25 Raiders that bombed Tokyo in 1942 and, leaving Tokyo, his plane got lost finally landing in Vladivostok. Russia was our ally, but not at war with Japan and, to maintain their peace with Japan, the Russians interned his bomber crew until near the end of the war when it was obvious that the United States would be the victor.

"One day," Ted continued, *"One of our Russian 'Minders' gave each of us two hundred dollars and told us to disappear. We walked for days, finally reaching Tehran, Iran." "There,"* he said, *"the American Embassy staff didn't believe our story for several days. They believed we had died back in 1942."*

I thought Ted was a major "BSer". But one evening, I found several library books describing the Doolittle Tokyo Raid and one had pictured a youthful Ted and his flight crew. I checked out the book and the next day I showed Ted the pictures. He laughed saying he didn't remember being that young. He had not seen the book before.

— Wayne King, Orange, CA

Ed's Ans.: It's vignettes like this one that makes an editor's task a wonderful experience! Thank you for sending it in.

Dear Ed,

Please accept my check for another year; I used to read the Bulletin to my husband, Wallace, when he could no longer see. So now, I give these to the ladies that send packages to military personnel serving our country.

— Ruth Lucille O'Brien, Albuquerque, NM

Ed's Ans.: We are sending you ten copies of the latest Bulletin by Priority Mail for your packages for the troops. If these are welcomed, we shall make it a point to send some from every issue.

Congratulations and Best Wishes to

Daniel and Maxine Hays of Folsom, California
celebrating their 73rd Wedding Anniversary

J. Peter and Beverly Brombach of Placentia, California
celebrating their 65th Wedding Anniversary

Keith and Ruth Boyd of Umpqua, Oregon
celebrating their 64th Wedding Anniversary

Frank and Reva Chudoba of Van Nuys, California
celebrating their 64th Wedding Anniversary

William and Nadine Giacone of Murrieta, California
celebrating their 60th Wedding Anniversary

Glenn and Marion Smith of Fort Mohave, Arizona
celebrating their 60th Wedding Anniversary

Daniel and Patricia Williamson of Prescott, Arizona
celebrating their 60th Wedding Anniversary

John and Mary Ann Wilson of Torrance, California
celebrating their 60th Wedding Anniversary

Raymond and Joan Bagby of North Bend, Washington
celebrating their 58th Wedding Anniversary

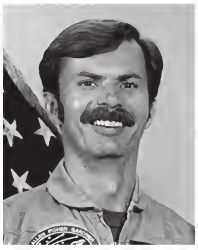
Ken and Patricia Granville of Bellflower, California
celebrating their 55th Wedding Anniversary

The Silent Majority

by Stan Guzy



POGUE, WILLIAM R. "BILL", 84 – Former NASA Astronaut, U.S. Air Force Thunderbirds pilot, author and educator, died on March 3, 2014. After receiving his B.S. degree in Education from Oklahoma Baptist University, he enlisted in the Air Force and received a commission in 1952. Pogue completed a two-year combat tour in Korea, and served two years as a member of the USAF Thunderbirds Demonstration Team, flying as solo pilot in the F-84F and F-100C and as slot pilot in the diamond formation. He served as an Assistant Professor of Mathematics at the U.S. Air Force Academy, followed by a two-year tour as an exchange test pilot with the RAF. He received his M.S. in Mathematics from Oklahoma State University in 1960. While serving as the chief of advanced projects at the USAF Test Pilot School at Edwards AFB, NASA selected him as an astronaut in 1966 and he was scheduled to be command module pilot on the Apollo 19 mission. When Apollo 18, 19 and 20 were cancelled, Pogue was selected to fly as the command module pilot of Skylab 3 (SL-4), Skylab's final crew—aboard which he made his first and only space flight and served 84 days. Retiring from NASA in 1977, Pogue became a consultant, accomplished public speaker and author completing five books. He was inducted into the U.S. Astronaut Hall of Fame in 1997.



GARDNER, DALE A., 65 – Former NASA Astronaut and Naval Fighter Pilot, passed away on February 19, 2014. Upon graduation from the University of Illinois, Gardner entered active duty with the U.S. Navy and was assigned to flight training at Pensacola. He graduated from Flight Officer training Squadron VT-10 with the highest academic average ever achieved at the squadron. After a stint at the Naval Air Test Center Patuxent River, he was assigned to the first F-14 Tomcat Squadron, VF-1. Selected as an Astronaut Candidate in 1978, he flew as a mission specialist on STS-8 and STS-51A and was chosen for the first launch from Vandenberg AFB which was cancelled after the *Challenger* disaster. In 1986, he returned to the Navy and, as Captain, was assigned to several Space programs. In 1990, he took on managerial positions with TRW and later, Northrop Grumman, and retired in January 2013.

HALPIN, WILLIAM H., 97 – it is with sadness that the Bulletin reports the passing of Bill Halpin at home in Las Vegas, NV. In 1999 when Boeing dumped us with nothing more than the address list of the 9,300 NAA retirees that were getting the NAA Retirees News for free, Bill Halpin sent us a check for $500.00 with a note, "You will need this. Use it wisely!" It became our "seed money" to establish a fund which paid for the four yearly "Outstanding Graduating Senior Cadet" awards at the U.S. Air Force Academy into perpetuity. During WWII, Bill built airplanes at Douglas Aircraft in Long Beach. Later, he came to LAD where he served for 24 years, retiring in 1972. Bill, our "Golden Eagle" is now with his beloved wife, Marion, and his grandson, Mark Suggs.

ACTON, KATHLEEN, 77 – passed away at her home in McLean, VA on August 23, 2013. Kathleen served at the Space Division and at the Corporate offices for several years. She is survived by her husband, Richard, who is also a retiree.

ALHADEFF, SONIA L. "SONNI", 80 – of Anaheim, CA died February 25, 2014 of natural causes. She joined NAA in 1956 after moving to to Anaheim. Sonni retired from NAA/RI in 1994. She is survived by her husband, Jack.

ANDREWS, BYRON E., 79 – of Indio, CA passed away on December 18, 2013. Andy joined NAA at Space Division in 1964 on the Saturn S-II, became Propulsion Manager at KSC and came back to Space Division for Shuttle Integration. Andy retired in 1994 with 30 years of service.

BJORKLUND, ALAN R. "AL", 80 – passed away in Las Vegas on January 1, 2014. Alan retired from the Boeing Corporate Office as Vice President of Facilities for Military Operations in 1999 with 38 years of service. He served at Rocketdyne, LAD, NASA Mississippi Test Facility, KSC and Space.

BRATTON, HIRAM R., 89 – died on December 16, 2013 at home in Glendora, CA. After graduating from LaVerne College he joined NAA/RI in 1961. Hiram became a single parent in 1975 after his loving wife, Lois, died.

BRICKERT, ROBERT, 89 – of Monterey Park, CA passed away on March 18, 2013. Using the knowledge he gained serving with the Army Air Forces, 5th Photo Section, 176th Tactical Reconnaissance Group during WWII, Bob joined NAA as a photographer and graphic services technician. He retired in 1984 with34 years of service.

DEWEY, OREN B., 89 – of Columbus, OH passed away on January 11, 2014. A veteran of WWII, Oren was small in stature but big on performance. He started at the Columbus Division in the tight spaces on the FJ Fury and F-100 airplanes being assembled on the production line. He moved on to the hydraulic shop and then became a liaison coordinator. Oren retired in 1988 with over 30 years of service.

HANNA, JAMES A., 89 – passed away at home in Huntington Beach, CA on December 25, 2013. He began his career as an instrument technician at the Pearl Harbor Navy Yard in Hawaii. Relocating to California, he worked at Aerospace Corporation and then NAA/RI. He helped design instrumentation for the Space Shuttle and the first GPS satellite. He retired from NAA/RI in 1988.

HEIMERDINGER, MARO W. "BILL", 88 – of Torrance, CA, died on January 5, 2014. Bill started at LAD in Quality, moved to M&P and retired in 1989. He completed his career in Aerospace at Northrop.

HOLMAN, MARILYN V. "PUP", 90 – passed away November 29, 2013. She graduated from Manual Arts High School and subsequently went to work for NAA. Always incredibly upbeat, generous, loving; she is survived by her daughters and extended family.

HOUSTON, BENNIE B., 82 – of Santa Maria, CA passed away on November 3, 2013. Bennie joined NAR in 1960 to work on the Minuteman at Cape Canaveral, Florida. He was transferred to Vandenberg AFB and from there to Autonetics on the Peacekeeper and small missiles. He retired in 1990 with 30 years of service and enjoyed a life of travel, golf and being a volunteer at the Santa Maria Museum of Flight. He is survived by his loving wife of 59 years, Olive.

KLEIN, EDWARD, 90 – of Costa Mesa, CA passed away on December 3, 2013. After serving in the Air Force, Ed garnered an engineering degree and went to work for Northrop on the Flying Wing. Later, to NAA, to work on jet propulsion systems including the X-15 and systems design on the Apollo. He retired from NAA/RI in 1981. Ed was predeceased by his loving wife, Eleanor.

KOZIOL, DENNIS E., 81 – passed away on February 13, 2013 in San Clemente, CA. He joined LAD in 1956 after receiving his M.S. degree in Systems Engineering. He rose to become an engineering manager of the B-1B flight control systems and retired as Director of Airframe and Systems Design in 1989 with 33 years of service. He is survived by his loving wife of 61 years, Violet.

McGOUGAN, WILLIAM S. – A Lost Sheep, his ex-wife reported that Bill died on June 3, 2011 in Palm Desert, CA.

McPHERSON, CHARLES W., JR., 86 – of Edmonds, WA passed away on December 13, 2013. Obtaining his B.S. in Metallurgical Engineering from Montana School of Mines, he joined NAA/RI as a quality control engineer for over 30 yeas before he retired. His wife, Martha, preceded him in death in 2007.

MOORE, ROBERT L., 93 – died at home from Parkinson Disease. After doing postgraduate studies at UCLA. Bob joined Rocketdyne as a program manager. In 1961, his dedication promoted him to becoming Asst. Chief Engineer on the S-II Program. Burial was held at the National Cemetery in Riverside. Editor's Alert: Please do not confuse this Bob with Robert L. Moore of Compton, CA.

MYERS, FRED – passed away on December 4, 2013. Fred had worked in Engineering Planning, Administration and Long Term Planning for over 35 years when he retired 1990. According to his close friend, Stan Haugh, he blessed many people with his warm friendship.

ODELL, I. GORDON – of Aliso Viejo, CA. Bulletin returned stamped "Deceased". Gordon retired from Autonetics in 1976 with 19 years of service.

REUTER, EDGAR F., 81 – of Brea, CA, died peacefully on February 13, 2014. He had a long career with NAA on the Apollo and other project before retiring. Eddie was married for 59 years to the love of his life, Nettie.

SMITH, MILFRED F., 87 – died on November 30, 2013. He served in the Marine Corps and the Air Force until 1986, retiring with the rank of captain. He received a B.S. in Physics and Chemistry from CSULB in 1956 and completed his M.A. degree in Computer Science from West Coast University in 1983. He worked for NAA/RI in Financial Management before retiring at age 58. He is survived by his spouse, Dianne.

SNYDER, WILLIAM "BILL", 88 – of Culver City, CA died on December 18, 2013 at the VA Hospital in Los Angeles. Bill served at LAD for 17 years, retiring in 1967. For the next 40 years, he was a Government Contractor for spare aircraft parts.

WILEY, DELMAR, 91 – of Fullerton, CA passed away on December 4, 2013. Doris, his devoted bride of 70 years, was at his side. Del served as a Naval Aviator in WWII and saw action during the battles of the Coral Sea and Midway. He was the sole survivor after his Torpedo Bomber was shot down and survived 15 days on a life raft before landing on the Carteret Islands. Receiving a degree in Electrical Engineering, Delmar joined Autonetics. In 1960 and worked on a variety of aerospace projects including Minuteman and the Apollo project before retiring in 1982.

WILLIAMS, FRANK J. – died in San Marcos, CA on March 24, 2012. Frank served in M&P at LAD until he retired in 1986 with 31 years of service.

LOST SHEEP, BULLETIN RETURNED WITH NO FORWARDING ADDRESS

BEN "BENNY" BACA – SANTA CLARITA, CA

TED L. MANN – FOUNTAIN VALLEY, CA

H. VERNON WOLFE – PARKER, CO

MATTHEW DOUGHERTY HAS BEEN FOUND IN POLSON, MONTANA

JOE COLETTA – FOUND, BUT PHONE MESSAGE GARBLED

"The only kind of dignity which is genuine is that which is not diminished by the indifference of others."

— Dag Hammarskjold

NORTH AMERICAN AVIATION
RETIREES BULLETIN
P.O. Box 3797
Seal Beach, CA 90740

North American Aviation Retirees Bulletin
"Where The Best Never Rest"

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Photo courtesy of Sam Sox, Jr.

"Blue-Nosed Bastards of Bodney"—352nd Fighter Group Commanding Officers and its Fighter Squadron Commanders stand in front of Col. Joe Mason's P-51D Mustang,* "This Is It!". *They are (left to right) Lt. Col. Jim Mayden, 352nd FG Deputy CO; Lt. Col. Willie O. Jackson, 486th FS Commander; Maj. George Preddy, 328th FS Commander; Col. Joe Mason, CO of the 352nd FG and Lt. Col. John Meyer, 487th FS Commander.

NORTH AMERICAN AVIATION
Retirees Bulletin
"Where The Best Never Rest"

Summer 2014

2014 North American Aviation Outstanding Cadet Recognition Awards



Cadet First Class Joshua Rivey
Outstanding Achievement
Aerodynamics

Cadet First Class Connor Wiese
Outstanding Achievement
Aeronautics Basic Research

Cadet First Class Glamis Koh
Outstanding Achievement
Astronautics

Cadet Candidate Elliot Knowles
Outstanding Cadet Candidate
USAFA Preparatory School

NORTH AMERICAN AVIATION
Retirees Bulletin

North American Aviation Retirees Bulletin, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAA Retirees Bulletin can be contacted at The Boeing Company, Seal Beach facility by phone at (562) 797-3836. Send mail to:

North American Aviation Retirees Bulletin
P. O. Box 3797
Seal Beach, CA 90740

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Dear NAA Retirees Bulletin Subscriber

With half the year quickly approaching, we look back and see that much has been accomplished in these months. Our KSC Memorial Bench fund drive has gone OVER THE TOP! We have ordered the bench and it is expected to be completed and delivered to the Kennedy Space Center in July. As indicated by the acceptance letter, the folks there are very excited and are looking forward to having it located in a prominent location.

Interestingly, less than 200 subscribers contributed enough for three memorial benches and, perhaps, enough for a fourth. Many of these contributors are the Ladies of North American Aviation. They are the Widows of NAA Retirees, making a final gesture of love, remembering their loved one. They are the Ladies that came to NAA as young girls filling in as typists and clerks, learning the NAA way of doing business and to this day working as executives and professionals in the business world. They are the Ladies that joined NAA on the production line and fulfilled the very responsible job of building the best aircraft and spacecraft until they retired from the line. We salute all of them! Bravo Ladies!

As you can see from the cover, we again visited the United States Air Force Academy with technical speakers in April, Charles and Allen Lowry, a father and son combination. At the end of May, Stan Barauskas represented NAA in presenting the North American Aviation Outstanding Achievement Award to the top performing Cadet Candidate at the Academy Prep School and Floyd Mohr did the same at the Aeronautics Department and the Astronautics Department graduations, presenting the North American Aviation Outstanding Achievement Awards to the Graduating Senior Cadets selected by the faculty at each school. It appears that we are the only Aerospace company that has any presence at the Academy. So be it! These bright young people will soon assume the roles of leadership in this great Nation and they will need every spark of encouragement and grasp of knowledge that we can provide them! God Bless Them All!

The 52nd Bald Eagles Reunion was held at a totally new venue—the Golden Sails Resort Hotel in Long Beach. The three ladies: Sharon Simonsen, her daughter Shannon Self and Cathy Baker and their volunteer committee organized the ball room handsomely with plenty of space between tables for easy access. The food served was of an excellent quality and the service was quick and efficient. The hotel provided extra help at the steps for the elderly and the handicapped. The guest speaker, William B. Scott—a flight test engineer, USAF test pilot, journalist and author—was an excellent speaker with many interesting experiences to relate. The attendance was down to about 240 but those that came felt the food, the speaker and the venue were excellent!

The articles in this issue should please subscribers from LAD, Space Division in Downey and Autonetics in Anaheim. Bob Olesen brings back a Legacy of Light that was associated with the design of the XB-70 and is used in aircraft to this day! Our Larry Korb started with an article on the Apollo-Soyuz Project, which emerged into an article about Deke Slayton and how his heart condition kept him grounded until the very last Apollo mission—the Apollo-Soyuz Mission. Finally, Bob Ward writes about a building at Autonetics that was the center of discovery and invention at Autonetics. You find some very interesting articles in the commercial publications and the NASA press releases but none achieve the depth and feelings of our authors because they lived these events and they relive them again in the words they transmit through the Bulletin.

The Russians charge us $70,000,000 each time they take an American astronaut to our Space Station. Evidently, the United States must purchase the powerful RD-180 Rocket Engines from Russia to launch our spy satellites to watch the Russians. In the meantime, the Russians use them to watch us! Now, Putin is threatening the United States about any future Space Joint activity. Where is Rocketdyne when we need it? Where is the Space Shuttle when we need it? Oh, that's right! Our Liberal Politicians in Washington decided, "Our Russian friends can do it for us!"

North American Aviation Outstanding Cadet Recognition Awards

Photos courtesy of Lt. Col. Kurt P. Rouser, USAF and Mr. Mark E. Winter

For the fifth year, the North American Aviation Outstanding Cadet Recognition Awards were presented to two United States Air Force Academy graduating seniors in the Aeronautics Department, one in the Astronautics Department and one in the U.S. Air Force Academy Preparatory School. These awards were sponsored and endowed by the North American Aviation Retirees Bulletin to be presented each year into perpetuity. In recognizing these outperforming and motivated individuals, we wish to perpetuate the very best in the future with the name of North American Aviation, the company where creative minds in design, ingenuity in manufacturing and dedication in field service provided the very best in the defense of our country. We think it only fitting that the name North American Aviation be associated with our young men and women who have volunteered to serve and defend our great Nation. God Bless them all!

The NAA Award Presentations at the U.S. Air Force Academy

My wife, Marilyn, and I have traveled the world, but we have had no more exciting experience than our visit to the Air Force Academy and to be able to recognize some of the Outstanding Cadets graduating this year.

Lt. Col. Kurt Rouser, USAF, Ph.D., became our personal "Attaché" during our visit. Everything had been very well planned and we were given VIP treatment including tours of the Astronautical and the Aeronautical Laboratories. I was then privileged to have a close-up view of 4,000 students marching in formation on Stillman Field.

The first presentation for Outstanding Cadet in Astronautics was to Cadet First Class Glamis Koh, an exchange student from Singapore. The next presentation for Outstanding Cadet in Aeronautics was to Cadet First Class Joshua Rivey. The final presentation for Outstanding Cadet in Aeronautics Basic Research was to Cadet First Class Connor Wiese. After the award presentations, we joined the Aeronautics Cadets and their families for lunch. I have never met more dedicated and brilliant young men and women.

The next day, we attended the Graduation Commencement Program for 995 Cadets held in Falcon Stadium. We had marvelous seats during Vice President Joe Biden's address, graduating cadets taking their oath to become Second Lieutenants, the Cadet Cap Toss and USAF Thunderbird demonstration.

We will never forget the inspiration of visiting with and observing these outstanding young men and women who are part of what makes our country great. We were invited back and are ready to go, but other NAA Retirees should also be able to enjoy and be encouraged.

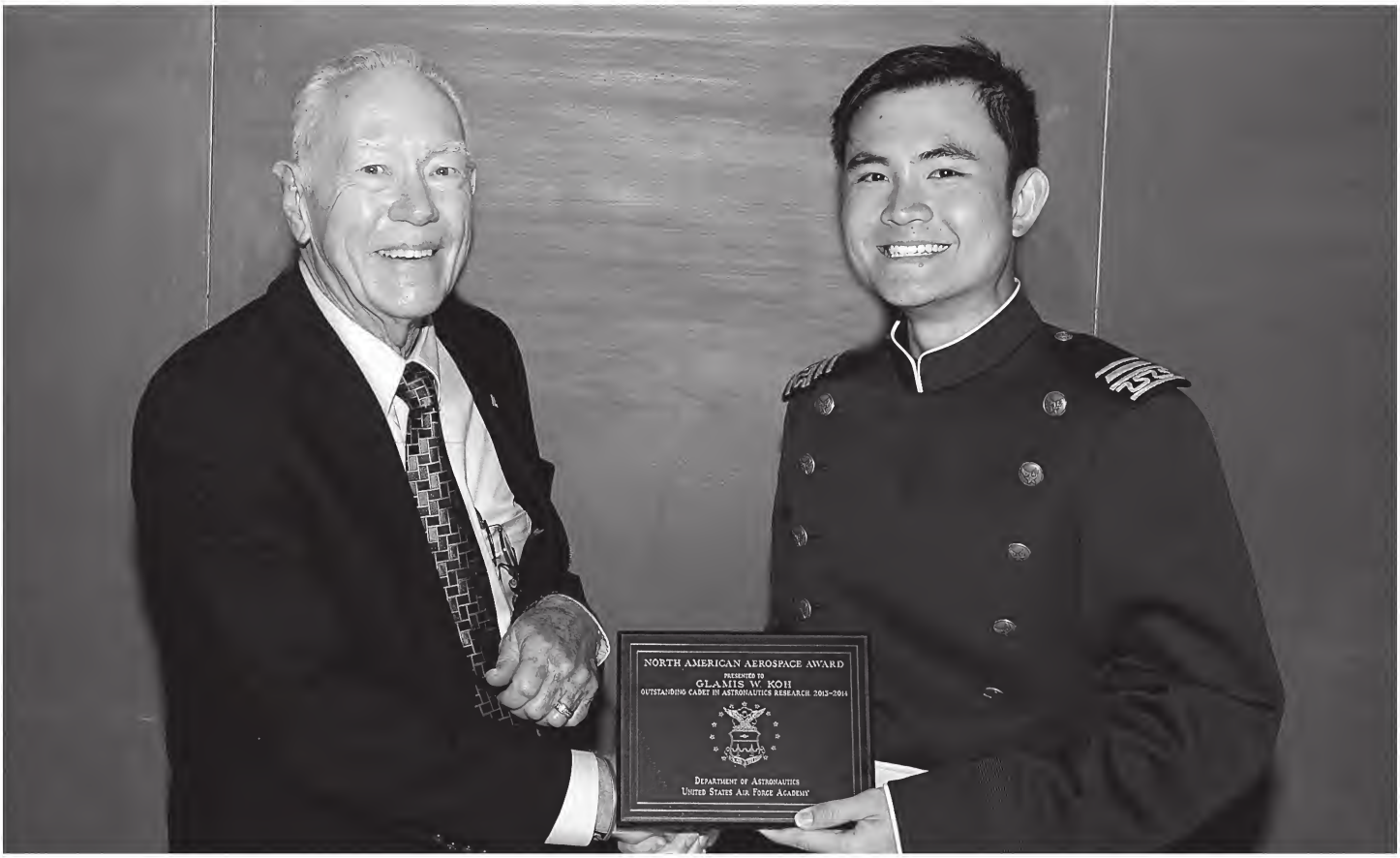
— Floyd Mohr, Proud NAA Retiree



On behalf of the Retirees of North American Aviation, Floyd Mohr presents the Outstanding Cadet in Aerodynamics Award to Cadet First Class Joshua Rivey from Missoula, Montana.



NAA Retirees representative Floyd Mohr presents the Outstanding Cadet in Aeronautics Basic Research Award to Cadet First Class Connor Wiese from Adrian, Michigan.



Cadet First Class Glamis Koh from Singapore receives the Outstanding Cadet in Astronautics Award from NAA Retirees representative Floyd Mohr.



NAA Retirees representative Stan Barauskas presents the NAA Outstanding Cadet Candidate Award to Cadet Candidate Elliot Knowles from Colorado Springs, Colorado. The U.S. Air Force Academy Preparatory School offers a 10-month program that consists of academic preparation, military training, athletic conditioning, intercollegiate athletics and character development to equip cadet candidates with the skills necessary for success at the U.S. Air Force Academy.

"The poet Thoreau said, 'A bluebird carries the sky on its back.' You are falcons, and you carry America on your back..."

— Vice President Joseph R. Biden
Commencement Address to the
U.S. Air Force Academy Class of 2014

A Visit To Be Cherished and Remembered

The United States Air Force Academy warmly welcomes all visitors from North American Aviation. They recognize and appreciate our interest in the cadets by awarding the Outstanding Achievement Awards each year, and for providing technical speakers to address the faculty and cadets. They are also much aware of our long-standing partnership in furnishing fine aircraft to the service through the decades.

I was pleased to be invited to the Academy this year as a speaker from the field of Manned Spacecraft—Apollo, Shuttle, and, currently, NASA's new Orion. My son, Allen, agreed to accompany me but when it was discovered that he is involved with the development of an advanced heat shield using inflatable technology, he too was asked to speak. We were the guests of the Aeronautics and Astronautics Departments.

The Academy had us heavily scheduled for both days. Over the two days, I spoke to two System Engineering classes and an evening Tau Beta Pi event. Allen spoke to an Aircraft Design class, and to the Faculty at a lunch event. We toured many labs and spent much time talking with the cadets and faculty on a one-on-one basis, which was a highlight of the visit-the cadets are actively designing and building scaled aircraft and satellite payloads, which they will fly. We also met with researchers involved in a unique wind tunnel testing program on textile flutter.

One day, we watched the 4,000 plus cadets form up for lunch in an inspiring ceremony, which reminds one of how proud we are to be Americans. Then we had lunch with a group of those wonderful young people at their table. We were also given a personal and extensive tour of the world-famous USAFA Chapel, which certainly was another highlight.

Throughout the visit, we were thanked over and over for coming and for speaking. It was very rewarding. Thanks to Ed Rusinek for cultivating this partnership and making it all happen.

— Charles Lowry



Photo courtesy of Lt. Col. Shad Reed

Charles and Allen Lowry meet the members of an Aircraft Design Class during their visit to the Aeronautics Department of the United States Air Force Academy. In an interesting exchange of ideas from the Past and the Future, both were deeply impressed by the technical level and depth of work being accomplished by the students.

"Leadership is a two-way street, loyalty up and loyalty down. Respect for one's superiors; care for one's crew."

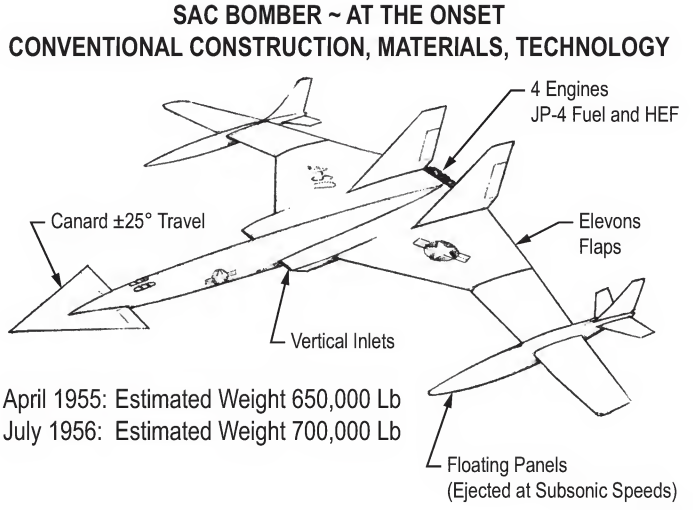
— Admiral Grace Hopper

XB-70 – A Legacy of Light

by Bob G. Olesen

Although it has been 50 years since the design phase of the long range B-70 bomber project came to an end, there is at least one element of its unique design features that is stronger now than ever. A brief introduction of these features is appropriate. There are few remaining design team members and memories of the achievement are fading fast. Most of this story is from my memories of those events.

The use of B-70 terminology is intentional because that is how the project was labeled at production design initiation. Preliminary design had been completed under the highly classified WS-110 program. Surprisingly, exactly how the project was labeled during the design phase was unclear and not generally discussed. Some facets of the aircraft remained in the 'not to be discussed' category and associated with a need to know. Even so, there was no tangible effort to hide the project once production design began. To completely hide such a physically large aircraft would have been difficult to say the least. (Drawing depicts NAA's original design.)



NASA

WS-110 (Proposed SAC Bomber)

Initially, the B-70 was a production contract for 125 Strategic Aircraft Bombers (SAC). At that time, a sort of semi-secret classification apparently existed. Contracting aspects were fitful and inconsistent during the early years and continuation of the project was uncertain. Opposition to production continued in some sectors of the procurement community. Unfortunately for NAA, controversy continued with some opinions claiming that it could never be built due to manufacturing unknowns related to necessary design features, others saying that it just could not possibly accomplish performance predictions, and yet others saying that it was a waste of time because of anticipated detectability. Those in the government Stealth Development community objected because of the presumption "that a totally undetectable bomber" could not be built. Others stated that the age of missiles had arrived, making bombers obsolete, and that the aircraft would just be too costly. History has shown that those who opposed the project were completely wrong in their assumptions! As I look back, it is obvious that very few individuals grasped the potential that the B-70 weapons system offered. Ultimately, the manufacturing technical problems were solved, the performance was superior to what was predicted and the aircraft was in essence produced within budget (murky as that was) and in an unusually short time. The prototype aircraft developed under this contract were very close to being a "production ready design." It truly was 50 years ahead of its time. Detectability was actually not a valid issue as large numbers of these aircraft could not be stopped successfully, even if extreme countermeasures were employed. Considering the Offensive Weapons that the B-70 could carry, if only one or two survived during an attack, havoc beyond comprehension would occur! Such countermeasures did not exist at that time and would have taken a superhuman effort to achieve. Those countermeasures could not have been developed even after many years of effort. As it stands, the B-52 has been rebuilt time after time so that it could be retained as a part of a significantly viable weapons system.

A frequent challenge to defense developmental spending has been: "Where are the benefits from all of this spending, particularly when projects are abandoned?" As it has turned out, the B-70 Project has provided an outstanding example of technology transfer to commercial aviation, but more on that later. In the originally stated production order, the B-70 was to have a Pilot, Copilot, Offensive Weapons Crewman and a Defensive Weapons Crewman. The procurement plan was to have each subcontractor provide his subsystem as an entity, including the required displays and controls for that subsystem. No documentation existed to assure that subcontractors provide displays and controls that would be compatible or provide the crewmen with any degree of uniformity. The same situation existed for the Pilot and Copilot stations. Thus, there was a dire need for a uniform and standardized approach to the aircraft presentations. In the original B-70 plans, it was proposed to utilize CRT displays in both the flight crew stations and the aft crew stations. These would provide more condensed information to the Pilot/Copilot and the Offensive/Defensive Crewmen, while requiring less instrument panel space. Also, there would have been multiple colors employed for the symbolic presentations on the CRTs. Instrument space was very restricted due to the configuration of the flight crew stations. These unique design constraints were fundamentally determined by the aircraft's aerodynamic configuration. During the 1950-60s the entire aircraft industry was becoming more aware of the critical need for increased data presentation to flight crews. Aircraft were rapidly becoming more complex to attain increased performance. The demand for more efficient display integration was extremely critical in the B-70. This integration necessity in turn contributed to a need for a uniform approach to design of crew station displays and controls. This demand evolved into a specification intended to satisfy that need for all four B-70 crew stations. I was selected to analyze and develop achievable standards for the aircraft and ultimately wrote that document for incorporation in the B-70. Some of the unique flight conditions had a significant impact on the final design requirements.

Numerous flight control operational details had to be analyzed and included in the development of the displays. As it turned out, a key factor involved was the necessity for integration of the illumination of all four stations displays and controls,



NASA Photo

XB-70 Ship #1 Final Version.

both individually and as a whole, in addition to the ambient illumination of those areas. Furthermore, the unique mission and required flight altitude of the B-70 imposed a radically different set of exterior ambient illumination conditions that had to be accommodated. For example, if Red floodlighting was used, there would have to be another White floodlighting system in the crew stations to use when flying at high altitude, so that the crew would not be flying during daylight periods inside of a "dark cave." Thus, if only White floodlighting were used, an entire lighting system could be eliminated. When area and volume is precious, comparatively small reductions in space and volume of hardware are significant. All factors had to be compatible as well as efficient. Cross-feed interference between crew stations could not be allowed to happen. All factors considered, it became apparent that White lighting of crew stations was the best choice for both integral and area illumination. From a hardware standpoint, smaller light sources would be more easily integrated with displays, consume less power and produce less unwanted heat in the Crew Stations. Cooling of the crew stations was accomplished with transpiration walls that evenly distributed cool airflow throughout the crew stations. Heat reduction in the Crew Station areas was important and smaller, less power hungry light sources would produce less unwanted heat. Aerodynamic skin heating created considerable cooling loads to be dealt with. Thus, if less heat were introduced by light sources, there would be that much less to remove. All factors being considered, including crew visual efficiency, visual fatigue, improved display presentations, hardware, operational factors and the best possible data presentation versus space available led to the conclusion that White crew station lighting would be the best option to use.

This concept was contrary to Red crew station lighting, which had been the accepted standard for many years. The White lighting concept was proposed to the USAF and tentatively accepted. Fortunately the contract called for a lighted mockup to demonstrate all of the crew station characteristics. When the USAF reviewed the mockup, they approved the White lighting concept. It became obvious: *"The mockup demonstrated that the concept was correct and a significant improvement and enhanced the use of color-coded displays over prior almost universal black and white displays."*

I presented a Technical Paper at the SAE A20A conference in 1958 that was held in Los Angeles and demonstrated the first control panel to be White lighted, explaining the derivation of the concept. There was a large group of industry representatives present at that meeting. From that point on, several airline representatives visited the Los Angeles Division and they were sold on the concept. Commercial aircraft companies began to incorporate this design into their new airliners. The B-70 change certainly expedited the adoption of what is now called the "glass cockpit." At that time it became obvious that for modern aircraft, Red lighting had become obsolete. At one time Red lighting was essential and beneficial, but with the advance of jet engines and higher flight altitudes, improved navigation aids and flight path control, visual reference to land characteristics was less important and thus crew dark adaptation was much less of a factor to be considered. Thus the B-70 led the way to improved crew efficiency through the introduction of White lighting in crew station areas. This is a specific and outstanding example of transfer of technology from military spending to commercial aviation. For my participation, I received Patent Number 3,267,598 for the initial design of control panel lighting. It has long since expired.

As an interesting and somewhat obtuse item, several years ago I asked a person, who certainly would know, the following question, "Are there some files relevant to the XB-70 designs that are still classified?" He answered, *"Well…there could be."* I asked this question without any lead-in so that I could see any expression on his face in response to the question. While he showed some surprise there was no emotion in any other way. We must all draw our own conclusions I guess.

A person can only wonder what could have happened to later strategic Bomber procurement and perhaps historical events, if the B-70 program had been allowed to "enter into production?"

Now as to why the B-70 legacy lingers on. One reason is because the aircraft introduced white lighting of crew station areas. Today, all commercial airlines fly white lighted aircraft—all attributable to the B-70 design efforts.

About the Author: Bob worked as an Analyst & Integration Engineer, in the Display & Control Systems Group with Walt Spivak, Chief Engineer for the B-70 & XB-70 Projects, and Crew Systems Manager Bruce Embody.

Deke Catches the Last Flight Out!

by Larry Korb

You had to feel sorry for Deke Slayton! He was one of Mercury 7 Astronauts, but never had a chance to fly in a Mercury, Gemini, or on an Apollo lunar mission. He was grounded because his heart occasionally skipped beats. The irregular heart beat would last for 2 or 3 days and then it would suddenly vanish. The flight surgeons grounded him! For 15+ years, Deke made the astronaut assignments for every flight.

After Apollo 14, Deke was talking to Alan Shepard. He said, *"I got a rotten cold before Apollo 13 flew. The flight surgeon, Chuck Berry, 'Turned me into a vitamin kick'…"* He said, *"It did a lot more than get rid of the damned cold. I haven't had a single skip of my heart in that whole time (~1 year). I'm telling every doctor and flight surgeon I see. I pound their desks and tell them, 'Hey, look, the heart's working perfectly!' "*

Shepard asked, "What do the doctors say?"

"They haven't cooperated one damned bit," Deke growled. *"Damn those people."* He added, *"They tell me to come down and take a battery of tests. Nine out of ten doctors say (the cure) is not possible."*

Deke mentioned why he didn't like the whole enchilada of testing, *"It was pretty dynamic probing. They hung me upside down on a treadmill, poked holes in me and pumped dye into my system. They then scheduled me for an angiogram."*

"There is a chance that the angiogram will kill you," the Flight Surgeon said.

"Screw that!" Deke balked.

Dr. Berry, a flight surgeon friend of Deke's, said, "Dr. Mankin is a top-notch cardiologist at Mayo Clinic. I'll send you there for a thorough examination." Deke went to the Mayo Clinic.

Dr. Mankin examined him and concluded, "All of your tests are good. If you pass an angiogram, I'll support you all the way."

"Hell, Doc, that's worth the risk," Deke acknowledged.

They poked a hole in Deke's arm and ran the probe up into his heart. Dr. Mankin spoke to Dr. Berry, the flight surgeon, and said, "Your man, Deke Slayton! This guy is as good as gold!"

Deke pursued his personal crusade to fly again. The majority of specialists, deeply impressed by Dr. Mankin's report, gave their blessings for Deke to fly again. After 13 years, his agony was over. He hurried to the office of Chris Craft and said, *"I'm no longer one of your managers. From this moment on, I am a prime candidate for a flight crew!"* Craft shook his hand enthusiastically and pounded him on the back.

Deke could have bumped someone from Skylab, but refused. On the immediate horizon was the Apollo-Soyuz Test Project. NASA decided that if Russia and United States could get together; we could make a joint mission. Thomas Paine, the NASA Administrator, obtained permission from President Nixon to contact the Russians through the American Embassy in Moscow. Russia was so suspicious of Tom Paine that he handed the task to Dr. Phillip Handler who met with his equivalents in Russia.

There were two purposes for the Apollo-Soyuz mission. First, it was a scientific attempt to lower the Cold War tensions between the two countries. Although, Nikita Khrushchev had proposed that USA and Russia follow a policy of "détente" in 1956, the countries were still confronting each other sixteen years later. The concept of détente was that of "Live and let live. Don't interfere with our policies and we won't interfere with yours."

Why all the suspicion? In April 25, 1961, we had the Bay of Pigs fiasco in which we backed an invasion of Cuba by Cuban exiles. On October 28, 1961, American and Soviet tanks confronted each other between East and West Berlin over a border dispute. On October 28, 1962, we confronted the Soviets, who were shipping nuclear missiles to Cuba (Cuban Missile Crisis). On January 4, 1964, Americans sent major military aid to South Vietnam, eventually entering into the war. On August 22, 1968, the Soviet army invaded Czechoslovakia.

We, of course, said our invasion of Cuba and Vietnam was to support freedom and the Russian invasion of Czechoslovakia was to subjugate people. Neither side trusted the other. We were close to nuclear war on a few occasions. Both sides recognized this mission as a political act of peace.

The second reason was, perhaps, that the two space powers could not help each other in case of a disaster or malfunction in space, such as a Space Station running out of supplies or a necessary evacuation of people. The Russian space vehicles operated at 14.7 psi atmospheric pressure with a mixture of nitrogen and oxygen and Apollo operated at 5 psi in pure oxygen. Not only was a common docking mechanism needed, but an air-lock to equalize pressure, before entering the other's space vehicle. For example, the Russians would get bends if they entered the Apollo spacecraft.

Dr. Paine said that we'll have a common docking mechanism and there was an enormous potential of achieving a mutual system, particularly for future space stations. (Not only was this a desirable goal, but it accommodated nine dockings by the Shuttle to the Russian MIR Space Station, starting with the STS-71 Mission.)

The seed was planted. On May 24, 1972, a Moscow summit meeting between the Soviet leader, Leonid Brezhnev, and President Nixon, resulted in the signing of this pact. The effort required 3 years of planning and engineering and cost about $2 billion in today's money. Crews of Russian cosmonauts and American astronauts were chosen for the mission. The Soviets had over 150 engineers and technicians involved in the design and manufacture of the hardware.

None of the American astronauts could speak Russian and none of the cosmonauts could speak English and neither could read the equipment markings on the other's spacecraft.

The first Russian cosmonaut chosen, Alexey Leonov was a joker, a tremendous athlete, and extremely well-trained. He also had made over 100 parachute jumps and became an instructor in the Soviet Air Force. He had flown in Voshkod II and made history with the very first spacewalk. The second cosmonaut was Valeri Kubasov. He made his first orbital mission in Soyuz 6 in October 1969. He had rendezvoused in orbit with Soyuz 7 and 8, and was involved in scientific experiments in space stations (welding, smelting, equipment teardown and repair). The Soviets had a single pilot and the other cosmonaut on the Soyuz was an engineer to fix anything that broke or didn't work. The Russian spacecraft were very simple in design and operation and had no redundancy. If a critical malfunction occurred, they immediately reentered and landed on Earth. Americans, on the other hand, had more sophisticated equipment and redundancy built in so missions could continue and astronauts were in a fail-safe environment.

The three-man astronaut team consisted of Thomas Stafford, 44 years old who had flown on the Gemini 6 and 9 missions and with Gene Cernan on Apollo 10 where they came within a thin edge of crashing on the Moon. He was an active Brigadier General in the U.S. Air Force.

Deke, 50, hadn't flown in space. He had been in charge of assigning major astronaut and back-up crews to each Spacecraft mission for 13 years, from Mercury, Gemini, Apollo, and the Skylab.

The Command Module pilot was Vance Brand, another 44-year old who was an aeronautical engineer but a "space rookie", like Deke.

Deke's major assignment during the next three years was to manage and coordinate the docking system development and manufacture. He made many trips to Russia to do so, often taking a staff of over 100 engineers.

The first Russian hotel they stayed in was comparable to a run-down hotel in a poor section of an American city. On his second visit, the Russians had built a special hotel for the Americans. It was fully stocked with food and drinks. The first night they complained to each other how bad the Russian beer tasted, and the next day their refrigerator was stocked with an excellent Czech beer. Another night, they muttered how great the accommodations were but lacked enough soap and towels. Next morning, additional soap and towels were delivered. One night, they complained about two technicians that were jerks and were slowing the effort. The next day, the two technicians were no longer on the program. The walls had ears. It didn't take a "Rocket Scientist" to figure out the Russians had the place completely bugged.

It was initially difficult to work through interpreters to develop space hardware and flight operational procedures involving the two countries. Initially, *"If we got 5 minutes work done in a day, we were doing extremely well,"* Chris Craft said. Eventually, they worked together and could get nearly a full day's work in a day.

Eventually the American astronauts had to take 700 hours of Russian and the cosmonauts had to take the same amount of English. The rule was that, when in Orbit, the Russians would speak English and the Americans would speak Russian. Leonov, the joker, commented that there were three languages spoken, for Thomas Stafford had such an Oklahoma twang, he was hard for the Russians to understand, who said he spoke Oklahomski!

Over this three-year period, the crew got to become great friends. The cosmonauts would invite the astronauts to their homes, sharing the meal with their family. The astronauts reciprocated, inviting the cosmonauts to their homes in Houston for a barbeque. The Russian couldn't believe astronauts had such great homes and thought they were subsidized. They also couldn't believe how American took off in their cars to go anywhere they wanted, without surveillance by an outfit like the KGB. Further, they were amazed that each building at the NASA base was not fenced in and the airports were open to admission without being totally enclosed in fences and that one needed no papers to enter.

The Launch

The Apollo Command and Service Module (CSM) with the Docking Module weighed 37,000 pounds. It was the last



NASA Photo

The Apollo-Soyuz Crews: Deke Slayton, Tom Stafford, Vance Brand, Alexei Leonov, and Valery Kubasov.

Apollo CSM launched. The Soyuz 19 weighed 15,000 pounds. The Soyuz was launched from the Baikonur Cosmodrome on July 15, 1975 about 7½ hours before the Apollo CSM left Kennedy Spacecraft Center. The Apollo CSM was not launched by the Saturn V stack. Instead, it was launched by a smaller booster, the S-IB. It was a rough ride. The S-IB vibrated, shook and twisted and was extremely noisy, unlike the behemoth Saturn V launch vehicle. Deke said the ride was like that of a small flea on a big dog's back that had just been soaked with water and it was shaking itself dry (or words to that effect).

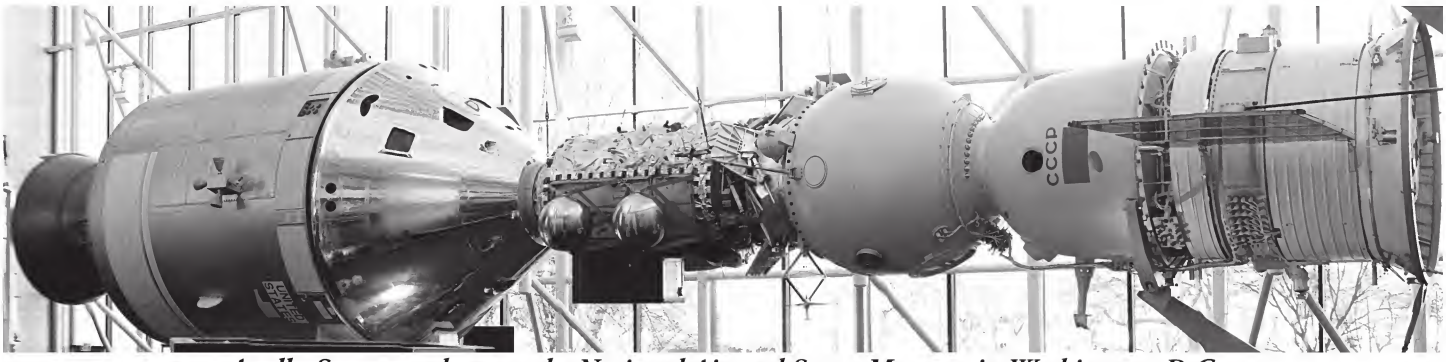
Both spacecraft were launched in 135-144-mile orbits and the Apollo had to catch up and dock to the Soyuz. They practiced docking and undocking maneuvers during which the two spacecraft changed roles from an active to a passive role. They docked initially on July 19, two days after launch. During the docking phase the Soyuz pressure was reduced to 10.2 psi.

Mission Activities

During the mission, the Russians and Americans exchanged handshakes, conducted joint scientific experiments, exchanged flags and gifts, signed certificates, visited each other's ships and exchanged seeds to plant trees in each other's countries. Both talked with their country's leaders. President Ford wanted to talk to Deke, the world's oldest astronaut. When finished, they closed the hatches. I was told by an astronaut that the Americans broadcast a tape on the loud speaker to the Russian Soyuz of a recent party in Houston where you could hear woman and men laughing. The Russian were excited and figured we might have something going on in, perhaps, the Service Module. They wanted us to reopen our hatch. (I have been trying to verify this story in writing, but I can't find a reference to it.)

As a final maneuver, the Apollo was put into space to throw its shadow on the Soyuz, so they could study the sun's corona around the solar eclipse created by the Apollo.

The Apollo stayed up three additional days, allowing Deke to study the Earth through its windows. He enjoyed watching the meteors streak by under the spacecraft and found watching



Apollo-Soyuz mock-up at the National Air and Space Museum in Washington, D.C.

the Earth was an amazing experience. His flight occurred 16 years after he was initially grounded.

Reentry

The most serious problem the astronauts faced was during reentry. Thomas Brand failed to throw two switches, one to turn off the RCS and one to turn off the venting. Nitrogen tetroxide entered the cabin through a relief valve. Brand lost consciousness briefly and Stafford retrieved the emergency oxygen masks, putting one on Brand and giving the other to Deke Slayton. Nitrogen tetroxide, a propellant in the RCS, exists in chemical equilibrium with nitric oxide. When nitric oxide dissolves in moisture, it will form nitric acid, a very corrosive substance, especially hard on the lungs.

The crew was late in operating the drogue chute and the Command Module hit the water "like a ton of bricks." The three astronauts were hospitalized for two full weeks. Damage was done to their lungs from these corrosive vapors. In an aftermath of X-raying of the astronauts lungs, doctors found a tumor in Deke's lungs and removed it, figuring it may be cancerous. It was benign. But if they had discovered it before the flight, Deke could have been grounded, again. The mission was a success and all recovered.

Author's Experience

In 1968, I became a dedicated jogger and, when I finished a run, I would put my feet high against a tree trunk to let the blood drain out of my legs and then take my pulse. I learned I often skipped beats. I subscribed to Runner's World and the doctor, writing a column in it, addressed this phenomenon. He said it happens to many people, is not threatening, and is no big deal, or words to that effect.

Eventually, I did some further research. The first thing I learned is that electrical nerve impulses result when the sodium and potassium ions trade places in the nerve. Sodium ions are normally on the outside of the nerve membrane and potassium ions are inside. When they switch places, a nerve is actuated and gives an electric signal. I went to my Adelle Davis book *Let's Eat Right to Keep Fit* (1964) and found that a deficiency of potassium in animals results in irregular heartbeats. I started insuring I got potassium daily (in a banana, for instance) and my heart stopped skipping a beat at once. I had no apparent problems for 44 years.

In 2012, I took my pulse and found I was skipping up to 5 to 6 beats per minute. I went to the local Emergency Center, had an EKG, and they confirmed it. They warned me to see a good cardiologist right away. I didn't. I thought back on my earlier experiences and started taking a banana every day. Immediately, my heart stopped skipping beats and, I have had numerous occasions to test my pulse since then. The problem has totally disappeared.

Today, skipping a heartbeat is called premature ventricular contractions (PVC) or premature atrial contractions (PAV). A PVC occurs when the out-of-synch contraction occurs in the heart's ventricle and a PAC occurs when it occurs in the atrium of the heart. "Skipping a beat" is actually an early heartbeat. Richard Passwater, in his book Supernutrition for Healthy Hearts (1976), cites that magnesium is involved in the retention of potassium and that a deficiency of magnesium results in arrhythmias, and can result in death. He gives the details of NASA's problems on Apollo in 1971 when astronauts David Scott and James Irwin both suffered from heart irregularities on their way back to Earth. They were diagnosed with potassium deficiencies by the astronauts' physician, Dr. Charles Berry. The potassium deficiencies became apparent by the extra heavy work performed by the crew and weightlessness, which increases the potassium excretion. Dr. Berry first noted the premature heart beats of James Irvin when he was working hard on the Moon. Irwin again suffered irregular heartbeats after three hours of work, transferring Moon rocks from the LM to the Command Module. David Scott's arrhythmias occurred because he was taking aspirin for a sore shoulder and aspirin accelerates potassium depletion.

A preflight loading of potassium and potassium-enriched foods was specified for Apollo 16 astronauts Charles Duke, John Young, and Ken Mattingly and they survived a 12-day flight without arrhythmias. Potassium deficiencies can come on rapidly and tests show that a group of people with high genetic needs for potassium; after being fed either salty food, refined sweets, or diuretic drugs experience paralysis within 24 hours. Other studies show muscular weakness can occur in a week with ordinary individuals on a highly refined diet. A caveat—too much potassium is also bad.

Deke, I think you may have suffered from the occasional lack of potassium. Too bad, it took until Apollo 15 for the problem to surface and the astronauts' doctors to recognize it. You could have been flying into space much earlier in your career.

About the Author: After thirteen years of scientific participation by Larry Korb in the Bulletin, what can be said about this great mind! He relates to technical events and issues that occurred 50 years ago as if they happened last week. He was our first technical representative at the U.S. Air Force Academy and we have to search far within our ranks to send someone of equal prowess. Accordingly, we invited Larry to be our Science Editor!

Remembering Autonetics Building 70

by Robert Ward

This article is about Autonetics Building 70 in Anaheim and the products that were assembled and tested there. I cannot possibly name the many thousands of people that worked there, three shifts a day, seven days a week, for years. Therefore, I will concentrate on the products only. However, I do thank each and every one that contributed to Building 70 for the amazingly accurate systems that were produced there.

The building looked like any other building on the complex located at La Palma and Miller Street except it was constructed askew to the front street, La Palma. It was built aligned to True North. This was done to reduce operator errors that may accrue during the many thousands of theodolite measurements that were performed during the many years that were to follow.

Building 70 was almost completed in 1963, in that the walls were up but the windows and doors were missing not to mention the security gates and posts that would eventually secure the building. The first system to be tested was the N7A SINS, which used G-7 air bearing gyros, and was to be installed on the Polaris missile submarines. These systems were classified, so we hung canvas on 2x4 studs erected around the test area to keep the contractor workers, still building infrastructure throughout the building, from observing our activities.

The system was tested in two steps: first, to check out all the subsystems and then moved to a special test fixture called a SCORSBY. This test station had three axes of motion namely roll, pitch, and yaw with the ability to vary the swing angles and speed of each axis. These tests required the stable platform's mirrors to be aligned to True North and optically read at certain periods of the test to verify the accuracy of the system when checked against the resolvers installed on the stable platform. These tests went for several days IF they met the specification requirements. Eventually, a second SCORSBY was installed to speed up production. The mechanical assembly of the platform took place a few feet from the test area. To build the stable platform, mating assemblies had to be optically flat which again required many optical tests and much lapping of the mating surfaces. The technicians worked many hours grinding these surfaces and checking them to see they were flat before they were assembled. As this went on, the system console was assembled in a nearby area.

After the building's doors and windows were installed and the guards posted; other systems were assembled and tested a few feet across the aisle. This included the N5G and N5H inertial guidance systems. The N5G would be installed on the Hound Dog missile and the N5H would be installed in the RA-5C Vigilante airplane built by the Columbus Division of NAA. Later, an Army program was underway which incorporated a gyro and a small theodolite mounted on a tripod. The gyro would find True North, calculate the required angles and send them through the suitcase of electronics to the Artillery, which would increase their accuracy. Great idea! Worked well! Except for one thing. The GIs would unload the equipment by heaving it out of the back of the truck. This usually broke the gyro or the theodolite when it crashed on the ground. The Army corrected this defect by canceling the contract.

Another very important system was moved to the other side of the building, this was the Minuteman I guidance system. This very reliable system contained the stable platform, its electronics and computer all in the same package. All of the subassemblies were individually tested and then installed in the frame that would hold all the assemblies. The gimbal assembly went through stress testing in that it was subjected to vibration testing in three axes; namely: the roll, pitch and vertical axes. This was done on large "shaker tables" which verified the structural integrity of the gimbals and gyros. Once this was completed and everything assembled in the guidance part of the nose cone, it was again sent through the vibration testing, only this time it was subjected to random frequencies in the same axes as before. After that, it was sent to a vacuum chamber where it was tested for leaks, and, finally, to another test area that ran it for a one hundred hour "burn in" where the accuracy was tested and infant mortality could be found and corrected if necessary. This system was so reliable (as I recall reading in the Autonetics Skywriter) that one system stayed on line in the missile for ten years. To achieve this level of reliability, every component was serialized and tracked.

Time went on and a new guidance system was designed for the Minuteman II missile. This missile would contain more warheads or "payloads" than Minuteman I. Fortunately, we did not test the bombs. This system utilized a new electronic component called the "integrated circuit" which replaced many components needed to achieve the same objectives of Minuteman I with reduced weight. The same tests were performed as on the Minuteman I prior to shipment. However, very early in the program, we shipped six systems to Cape Canaveral on a Friday night and got them all back on Monday morning. This kept recurring and a lot of people got involved. Everything was scrutinized including the assembly and test. The methods and procedures were checked and rechecked, but nothing was found and yet the systems were failing when received at the Cape. When returned from the Cape, functional test could always find and replace the bad component. The system was retested and reshipped to the Cape. Same story! They would fail upon arrival!

Finally, someone took the cap off one of the failed integrated circuits and "low and behold," it contained solder balls and wire bits. That happened during the manufacturer's process and became detached during shipment to the Cape. It appears that the rough handling the system received during the loading process and the high "g" forces experienced on landing did what our vibration testing could not do which was shake the debris loose. The problem was resolved by having the vender do additional testing on the components at his factory. Minutemen II was eventually succeeded by Minuteman III where the test processes were repeated as in the two earlier systems. This advanced guidance system allowed the missile to steer itself as it went down range before releasing its warheads to multiple targets.

The Navy wanted to upgrade the submarine guidance systems and Engineering produced the N7F system which was manufactured and tested in the same area as the N7As. This system was physically larger and more accurate with accuracy improved by better manufacturing methods and improved programming. I should include that the G-7 gyros that were produced in Building 71 were amazingly accurate and produced by the Assembly and Test people there. These systems were basically tested in the same manner as the N7As except the accuracy requirement were increased and most of them were accepted using only a small portion of the specification.

The Vietnam War was ongoing and the Air Force needed a new airplane, which turned out to be the General Dynamics F-111, and Autonetics designed the Inertial Guidance system for it. The F-111, designed to be an all weather aircraft, imposed some difficult requirements on the guidance system. It had to operate in very cold weather and/or very wet conditions. To accomplish this, some of the electronic modules were coated with a special sealant and the whole Guidance System was subjected to a cold soak of -65 °F for five hours. Then, the power was turned on and sixteen minutes later it was operating in navigation mode. This was performed on every system built for the aircraft.

In the early Seventies we built and tested all of the power controller units, some of the cockpit flight controllers, ordinance ejectors and test equipment for the B-1A bomber.

The Navy again wanted to update the guidance system for the attack submarine fleet and asked Autonetics to design the system. This became the MINISINS which contained some of the F-111 components along with some new ones, but had to meet a forty hour navigation requirement plus additional test requirements that included a "slave alignment" to another MINISINS and then pass forty hour performance test as this was the way it was used aboard the boats. This was the only production system tested in this manner.

The Navy wanted a more accurate system for the attack boats which lead to the T-ESGN that incorporated a very small ball that was levitated in a cavity with one and one half micro inches between the ball and the cavity, this was the electrostatic levitated gyro developed by Engineering. This stable element was about the size of a football and contained the gyro, accelerometers and all of the electronics needed for its operation. In addition to the normal performance tests, special tests were required in that air and structure borne noise had to be measured at the IMU (Inertial Measuring Unit) in its shock mount, the system console, and all blower assemblies. These tests had to be performed in an anechoic chamber that was built in the test laboratory. The navigation performance tests were performed on a divider head (a machinist tool) that was set to different headings. The SCORSBY test station was not required due the unique gimbal flipping of the gimbals when it was in navigation performance.

We got into the sonar processing game by way of software. We produced an analyzer and recorder that could receive sonar data via real time (radio) or by recorded tapes and print out the results on recording paper. The speed of this processing was amazing as it was done at sixteen times real time. When operated, the paper would spew out several feet from the recorder. These units were for shore base or carrier use as they were not small components. We also produced analyzing equipment that were installed on the submarines which displayed the data in a form that looked like a waterfall and that was what it was called. This equipment was so accurate that it could tell you the class and name of the submarine you tracked. We also produced a "boat" control console that contained two helms positions, provided missile tube status, depth, speed, hull control positions to name a few of the many monitored functions.

A new guidance system was developed for the "boomer" Navy which utilized the new electrostatic levitated gyro. This would become the ESG (Monitor) guidance system which was initially used to monitor the N7F systems currently installed in the missile submarines. When that program was completed, the start of the ESGN program began. The system was comprised of three units, a console, a stable element and a Navy supplied Computer. The pre-performance testing took about thirty days to complete which was almost as long as the thirty day performance test. Most of all, the electronics components were comprised of Standard Navy Electronic Modules which numbered over one hundred items. These units were connected via hard wiring on the back plane and mounted on a frame called a "page". The system contained three of these pages located in the system console. One of these pages contained 11,000 wires which made it very difficult to find wiring errors or small wire shavings and bits not found during the assembly process. The stable element was moved to the SCORSBY and tested as all SINS systems were. Due to the length of test time and danger of losing wall power, we used portable power converters, backed up with battery power which in turn were backed up by emergency generators. This proved to a very good foresight when during a heavy rain storm, a water leak in the power distribution room wiped out the power for the entire building. The backup systems worked as designed, so testing continued as normal until normal power could be restored.

One time, a submarine Captain came through the test area on a tour of the plant. As we were talking, he mentioned that he would like to make an entire cruise deployment of ninety to one hundred twenty days without resetting the system from GPS. He felt the system had more errors inputted to the system via the GPS reset than exited prior to it, but could not do it due to regulations. I thought that was a tremendous endorsement for the program. In 1988, we had an N7A, N7F, MINISINS, ESGN, and the T-ESGN being tested all at the same time either as new production or fleet repair. This event covered a span of forty or more years that Autonetics supported the Naval submarine forces, so I invited the program management people to be part in this event.

It's all gone now, the building where I and many people spent many years of our lives working and testing these amazing machines we called "Ships Inertial Navigation Systems". Military contracts were fewer and farther between which resulted in reduction of work force and buildings by Rockwell. The system test area was relocated to another building as profit margins were reduced. Rockwell sold the division to The Boeing Company. Boeing later moved everything to the Seal Beach facility and the buildings were sold to other enterprises. Building 70 was razed and a hospital parking lot was built on the site location. A few years later, the City of Anaheim erected a monument near the former site of Building 70 in recognition of the products it produced in support of the different military programs. The monument included some brass plaques naming these programs. Sadly, I was told these plaques were stolen for the scrap value of the brass.

I wrote this leaving out individual names as no single person could have made the Division as great as it was. It took thousands of brilliant engineers, technicians and skilled crafts people to accomplish that. I retired in 1993 and was fortunate and proud to be one of them.

About the Author: Bob joined Autonetics as an inspector in Building 6 in Downey and was assigned to the N7A program in Building 4. With the move to Anaheim, he advanced to test engineer on the new MINI SINS program and then to Manager of the test engineers on the various Navy programs and the Systems Test Area. He retired and currently resides with his charming wife, Carol, in Deming, New Mexico.

Letter of Acceptance of the NAA Memorial Bench for the Kennedy Space Center

National Aeronautics and Space Administration

Kennedy Space Center
Kennedy Space Center, FL 32899

March 5, 2014

Reply to Attn of: EX-G

Mr. Ed Rusinek
Editor NAA Retirees Bulletin
11291 Wembley Road
Rossmoor, CA 90720

Dear Ed:

Thank you for the donation of the black granite bench provided by North American Aviation, Inc. (NAA) to the Kennedy Space Center Visitor Complex (KSCVC). Our Visitor Complex is undergoing exciting changes, and transforming every day to expand the needs of our guests. This bench, donated by the North American Retirees, will be placed in a prominent location at the KSCVC.

Thank you again for the donation, and your continued support of our nation's space program.

Sincerely,

David A. Culp
Acting Director, Education and External Relations

cc:
Mr. Lee Solid
Delaware North/DNPS/Mr. McBride
Delaware North/DNPS/Mr. Protze

Accounting for NAA Memorial Bench at the Kennedy Space Center

by Ed Rusinek

Total Funds remaining for NAA Memorial Bench at the Kennedy Space Center ..$3,642.05

List of New Donors for NAA Memorial Bench at KSC

Name	City	Division Affiliation	Rememberance
KSC NAA/Rockwell Retirees Luncheon Group		NAA/KSC	In Memory of All Retirees That Served America's Space Programs at KSC
Vincent E. Ramirez	Chino Hills, CA	Corporate, Seal Beach	In Memory of My Brother, Augustine Ramirez, World War II Veteran
Nolan Leatherman	Reynoldsburg, OH	Columbus	In Memory of My Friend, Reuben Best, Columbus
Jack & Darlene Medina	Boulder City, NV	S&ISD	In Memory of the NASA/Aerospace Manned Space Flight Awareness Panel (MSA)
Gerald W. Miller	Los Alamitos, CA	Autonetics	In Memory of My Friend, Jimmy J. Justus, Autonetics
William F. Daugherty	Corona, CA	S&ISD	In Memory of All My Present and Past Co-workers from Cape Canaveral, FL, Rocketdyne Research Center, CA and Space, Downey, CA
Joseph P. Onesty	Seal Beach, CA	S&ISD	
Kenneth E. Fowler	Yucaipa, CA	LAD/S&ISD	
Eugene H. Ricketts	Beeville, TX	LAD	In Loving Memory of My Parents, Harry and Violet Ricketts
John & Vivian Andres	Seymour, TN	Satellite Systems	In Honor of Our Son, Captain Gary M. Andres, USN (Ret)
Richard L. Acton	McClean, VA	S&ISD	In Loving Memory of My Sister, Virginia Acton Gearhardt, Autonetics
George G. Brennan	Hawthorne, CA	LAD	
Ken Granville	Bellflower, CA	S&ISD	In Loving Memory of My Father-In-Law, Bill Ahern, Director of Quality Control at S&ISD
Arthur Tuoto	Long Beach, CA	S&ISD	In Loving Memory of My Wife, Betty A. Tuoto
Dale & Peggy Stinson	Sun City, AZ	LAD/Seal Beach	
Jacob A. Borror	Columbus, OH	Columbus	In Memory of Charles Murphy; My Son, Dave and the Property Management Organization at KSC and JSC
James D. Peebles	Melbourne, FL	S&ISD	In Loving Memory of My Father, Alfred Peebles, Columbus; My Uncle, Dewaine Peebles, LAD/Space; and My Brother, William Peebles, Columbus/Tulsa
Paul N. Hirsh	Murrieta, CA	S&ISD	In Memory of John McLuckey, Our Last President of North American Rockwell
Avonelle Rohe	West Hills, CA		In Loving Memory of My Husband, Donald Rohe, Rocketdyne
Frank H. Beckman	La Mirada, CA	S&ISD	In Memory of All the X-10 and G-26 Aerophysics Pioneers at Downey, Edwards AFB and Cape Canaveral
Stanley Thimakis	Tustin, CA	Autonetics	In Memory of All the Brave Space Shuttle Crews, Especially Those on the *Challenger* and *Columbia*
Sid R. Finks	Palo Cedro, CA	Rocketdyne	In Honor of Samuel K. Hoffman, the First President of Rocketdyne, for his Guidance in the Development and Production of Multiple Liquid Rocket Engines for Space Flight
Lyle Stoltenberg	Redondo Beach, CA	S&ISD	In Memory of North American Aviation and the Wonderfully Talented People That Served There

Total Funds Available $7,512.05

Contrails From The Past

by Ed Rusinek

Dear Ed and Floyd,

We want to thank you again for supporting our graduation awards, lending some external validation to the wonderful work accomplished by the cadets.

— Lt. Col. Kurt Rouser, USAF Academy

Ed's Ans.: Since you are training the Best of the Best, we consider it a great honor to be welcomed on your campus and to provide whatever encouragement we can to these dedicated young people! We only regret that we can no longer provide them with the "tools" to perform the tasks that await them!

Dear Ed,

The Winter 2013 Issue got me thinking of the contrast between NAA and Rockwell. On the 25th Anniversary of NAA, Dutch Kindelberger gave a banquet for all members of supervision. In his talk, he stated three objectives of NAA. First, to produce the best possible weapon systems for the U.S. Military. Second, to treat all employees fairly. Third, to make a fair return for the stockholders. He made it clear that when dealing with the U.S. Military, you would always "Make square corners!" Under Rockwell, the first two objectives were forgotten. The Third became the only objective even if it meant "cutting corners".

John Moore assigned me to work with the Columbus Division to define the electronic systems for the Vigilante. It was truly a spectacular airplane. Frank Compton and I prepared a set of "Flip Charts" to brief the Navy on its capabilities. Frank placed all the charts on a motor driven roller so that you could run through a mission by pushing up and down buttons on the pointer. Before going to all the key naval stations, we briefed Dutch. Frank would cover several charts and hand the pointer to me. I would define what the electronics were capable of doing during the mission and return the pointer to Frank. When we finished, Dutch commented that it looked like an excellent system and we should be able to sell some airplanes; but before we go on the road, *"Oil the damn thing or teach it to play 'Anchors Away!' "*

The Columbus Missile Group was also quite innovative. I spent some time with them on TV guided bombs and missiles and with the laser guided Hellfire missile. I loved the slogan in their conference room, "READY, FIRE, AIM."

Over the years, I worked with people throughout NAA and found them all to be exceptional. I believe this goes back to the leadership of Dutch and Lee. Every day was a challenge but fun and exciting. When the Rockwell "Bean Counters" took over, things changed and we all know the results.

— Jeff Schmidt, King City, CA

Ed's An.: To paraphrase Adlai Stevenson after he lost the election to Ike Eisenhower, "It hurts too much to laugh and I am too old to cry!"

Dear Ed,

I just finished reading the Spring Issue and realized that I may be one of the last of the aircraft design team of the 40s and 50s. I celebrated my 98th birthday in January, and my 38th year of retirement in March; I should mention that I have been married for 72 years!

I was a supervisor in Advanced Design when we won the contract for the Mach 3 Long Range Interceptor. In the years that followed, I was Principal Scientist in Life Science on the Apollo, Chief of System Design in Ocean Systems and a Project Engineer on the B-1 and Space Shuttle. In looking back, I think the happiest and most productive years were in Advanced Design, working for Howard Evans and the small group of designers, all of whom have preceded me and are now a part of our history.

— Charlie White, Spring Valley, CA

Ed's Ans.: How wonderful to receive another letter from you, Charlie. Being 98 years young, you are a delight to chat with. Let's hear from you when you reach the Century mark.

Dear Ed,

I started at Cape Canaveral in 1953 and Rocketdyne Research Center until the Apollo Program began. Transferring to Downey, I followed the X-10 Navaho missile tests at Edwards Air Force Base when I was sent to White Sands, NM where I established the Reliability Failure Reporting and Corrective Action System (FRACAS) for the Abort System Tests there. Then it was off to the Cape for the Apollo Boilerplate Tests. Again, returning to Downey, I followed individual Apollo Command and Service Modules through their mating and testing. After the last Apollo splashed down, I was reassigned to the B-1A program as Project Manager of Maintainability for all mechanical systems. With the cancellation of the program, I returned to Downey to assist in the development of the Space Shuttle Control Center. When the Air Force reopened the B-1B program, I went back to LAD to assume my previous assignment until I retired after 38 fantastic years with North American Aviation.

— William F. Daugherty, Temescal Valley, CA

Ed's Ans.: I've known you for many of those years, Bill, but I was never aware of how many programs and test sites you were there; tracking failures and, subsequent, corrective actions. You represent all the finest qualities that made North American Aviation the finest of the finest.

Dear Ed,

I look forward to each issue and attending the annual Bald Eagles luncheon. Many thanks to all of you dedicated people for an interesting read and for keeping the spirit of NAA alive.

— Bob Davis, Camarillo, CA

Ed's Ans.: Thank you for those kind words. The spirit of NAA never was in doubt. The spirit of some of our leadership, however, left many unanswered questions!

Dear Ed,

Thanks for the superb job you folks are doing. I look forward to each issue and "stroll down memory lane!" Your articles bring back some great memories of the 31 years I spent at Downey. Just passed 88 and I am still ticking.

— Ed Griffith, Lake San Marcos, CA

Ed's Ans.: I am often told by outsiders that I make NAA sound like something so extraordinary, it was beyond the dozens of other aircraft companies that existed at the time. All the aircraft companies were outstanding and, so to beat them, you had to be even better and NAA was the best!

Hello Ed,

I sent the following letter to Dr. Peter Jakab, Senior Curator of the Smithsonian Museum:

Dear Dr. Jakab,

Today I received my copy of the NAA Retirees Bulletin that included your letter declining our group's offer of a memorial bench. I found your logic for this decision very difficult to understand.

You pointed out it would establish a precedent. What in the world can be wrong with establishing a precedent that recognizes achievement? What would be so terribly wrong if other organizations requested similar objects be put on display at no cost to the Institution. If accepting this offer would generate an unmanageable volume of other like gifts, that could be handled by creating criteria for this type of volunteered gift!

Sincerely,

John Flynn, Retired NAA Employee, Hobe Sound, FL

Ed's Ans.: Thank you Big John for summarizing what every one thought but were unwilling to throw down the gauntlet and challenge the Establishment! Our Nation is governed by a growing number of Bean Counters who think they are the "Keepers of the Criteria" as to deciding what, when and where things should be done!

Dear Ed,

I wrote to Lt. Col. Gliechman regarding his grandfather, Bob Weebe. Thank you for putting me in touch with him—we had several phone conversations about my husband, Chuck, being one of his lofting students at LAD. I only wish I could remember more of what Chuck said about Bob Weebe.

Enjoyed reading Dan Nelson's article in the Winter Issue as I well remember Dan, at Seal Beach and at Downey. Like Chuck, his drawings and E.O.s were always so neat—not all engineers' were. Thank you for the great job you and your staff are doing. I look forward to each issue.

— Bettye Edzel, Hays, KS

Ed's Ans.: It is obvious that the years have not slowed down your marvelous memory. Thank you for the clarity with which you reminded us of a different time and a different approach to Design. I recall the best draftsmen working, next to our Stress Group, on huge drawings glued down to metal sheets to keep the lofting lines from shrinking!

Dear Ed,

Great job! Getting not just one bench but two Memorial Benches for good ole NAA!!! Thanks for all the work you do in putting out the newsletter.

— Doris Bybee, Anaheim, CA

Ed's Ans.: We ain't done yet! It's on to the Kennedy Space Center. We showed them the photos of the first two and they loved them and want the third. Just to list all the Rocketdyne engines would take half the space on the bench!

Dear Ed,

I'm Ruby Hales—wife of Gene Hales. Gene died last year on January 18, 2013, but he never really talked about his work. I know he started at NAA in May 1939 as a lathe operator and retired in February 1981 working on the first Space Shuttle.

We lived here in Oklahoma but always went back for the Bald Eagles luncheon. He enjoyed working for NAA and never had a mean word about anyone he worked with.

Gene and I were married for 42 years. He died peacefully at home in bed. It was the worst day of my life. I am taking the Bulletin for another year for Gene.

— Ruby Hales, Stuart, OK

Ed's Ans.: Thank you Ruby for your beautiful love story. It is obvious that Gene was an extraordinary man.

Congratulations and Best Wishes to

Eugene and Bonnie Ricketts of Beeville, Texas celebrating their 72nd Wedding Anniversary

August and Irene Anderson of Signal Hill, California celebrating their 70th Wedding Anniversary

William and Betty Anderson of Seattle, Washington celebrating their 70th Wedding Anniversary

Harold and Betty Hayes of Medford, Oregon celebrating their 70th Wedding Anniversary

James and Geraldine Haywood of Franklin, Tennessee celebrating their 70th Wedding Anniversary

William and Lina Pelzer of Whittier, California celebrating their 68th Wedding Anniversary

Virgil and June Crawford of Gold Hill, Oregon celebrating their 65th Wedding Anniversary

Eugene and Shirley Somers of Orange, California celebrating their 64th Wedding Anniversary

Guido and Antoinette Frassinelli of Rancho Palos Verdes, California celebrating their 60th Wedding Anniversary

Rainis and Margaret Krigens of Riverside, California celebrating their 60th Wedding Anniversary

David and Reba Lewis of Fullerton, California celebrating their 55th Wedding Anniversary

Jack and Darlene Medina of Boulder City, Nevada celebrating their 36th Wedding Anniversary

52nd Bald Eagles Reunion Luncheon

Photos by Lee French



Bald Eagles President Erik Simonsen



Scott White, Sam Iacobellis, Bill Scott and Kevin Scott



Guest Speaker William B. Scott



Sharon and Erik Simonsen, Shannon Self and Cathy Baker



Martin La Rocque and George Page



Janet Bisbey, Nelson Slagle and Dick Bisbey



Lee Norwood, Ruth Brooker, and Mary and John Perrault



Gene Salvay



Ann DeBriere, Rubye Richey and Bette Addington



Ace Evans

The Silent Majority

by Stan Guzy



DANA, WILLIAM H. "BILL", 83 – a famed NASA research pilot, he was one of 12 pilots selected for the X-15 flight test program. He flew 16 flights, reaching a top speed of 3,897 mph or Mach 5.53 and a maximum altitude of 307,000 ft. The X-15 pilots were one of the first to test pressurized spacesuits, the effects of zero gravity on pilot performance and jet controls and other mechanical devices to orient vehicles in outer space. Bill Dana graduated from West Point, became an Air Force officer and a fighter pilot in the Korean War. He received an aeronautical degree from USC and became a research engineer at the NASA Station at Edwards AFB. He became a test pilot the following year. He died from complications of Parkinson's Disease in Phoenix. Long time readers will recall the splendid article provided in the Fall 2006 Issue of the Bulletin by Bill Dana on the History of the X-15. He is survived by his loving wife, Judi.

BALOFF, OLEG J. "O.J.", 90 – of Thousand Oaks, CA passed away on March 8, 2014. After a three-year stint with the Army's 13th Airborne, he earned a degree in Civil Engineering and an M.S. in Industrial Management. His perseverance, consistency and hard work served him well with North American Aviation. He is survived by his wife, Janice.

BIGGS, ROBERT E., 80 – passed away on March 16, 2014 in Westlake Village, CA. Bob joined NAA on the Navaho project. This was followed by a stint on the Jupiter program and as manager of the Dynamic Analysis Laboratory. For nine years, he was a development engineer on the F-1 Engine Program for the Apollo-Saturn first stage. As one of the original team engineers on the Space Shuttle Main Engine proposal, he was the development manager and chief project engineer on the SSME. He retired from Rocketdyne with 54 years of service. He is survived by his wife of 40 years, Arlene.

DRAZICH, NICK D., 91 – died on March 16, 2014. After service in the Army, Nick earned an M.S. degree in Mechanical Engineering and joined NAA in 1948. He retired as a manager from Rocketdyne after 34 years of service. He is survived by his wife of 42 years, Norma.

MITCHELL, EUGENE M., 91 – of Laguna Woods, CA, passed away on March 24, 2014. Gene worked in several industries before becoming the Personnel Manager (Human Resources) at NAA/RI Newport Beach from where he eventually retired.

MULLINS, CORNELIUS "NEIL", 82 – passed away at home in Vista, CA on April 11, 2014 with his loving wife, Joan, at his side. It was their 61st Wedding Anniversary. Neil joined NAA at Cape Kennedy in 1967 after the Apollo 1 fire and became Director of Launch Operations. In 1976, he transferred to Edwards AFB as Manager of Test Operations and, subsequently, moved to Rocketdyne as Production Director of Central Manufacturing. In 1983, he became Factory Manager in Downey. Neil retired in 1989 with 22 years of service.

MYNAR, WIL, 72 – passed away at home in Fountain Valley, CA on July 16, 2013. Wil joined NAA at KSC Test and Checkout for the Apollo/Saturn program. He retired from the Shuttle program in Downey as Director of Safety.

RAYNESFORD, JOANN, 82 – of La Palma, CA passed away on October 21, 2013. Joanne was a very accomplished lady, retiring from the Corporate Offices at Seal Beach in 1988 with 28 years of service.

RICE, ALEXANDER C., JR., 88 – passed away on April 30, 2014 in Sun City, CA. Al held several key positions over 23 years of service at Autonetics Marine Systems Division on the Inertial Navigation and Sonar Systems program for the United States Nuclear Submarine fleet. He is survived by his wife of 52 years, Pauline.

ROBERTSON, ALBERT R., 85 – died on February 14, 2014. Albert joined LAD as an engineer and retired to Hemet, CA in 1984 with 34 years of service. He is survived by his loving wife, Jean.

ROHE, DONALD J., JR., 89 – passed away peacefully at home in West Hills, CA on March 15, 2014. Returning from service in the USAF, Don joined Rocketdyne in Quality Control. He enjoyed working with his coworkers and was very proud of being part of North American Aviation. He retired in 1985 with 40 years of service. He is survived by his loving wife, Avonelle.

ROZNOS, VIRGIL F., 78 – died at home in Garden Grove, CA on May 21, 2014. After graduating from Iowa State University, Virgil came to San Diego, moved to Nebraska to work on ICBM missile silos, then joined NAA at Space Division in Downey. He retired in 1996 with 34 years of service on the Apollo and Space Shuttle programs. He is survived by his loving wife Karen.

STAYBOLDT, GEORGE, 94 – passed away on April 1, 2014 in Spring Valley, CA. George started at LAD in 1947 as a Draftsman in the F-86 Project Group, then as a designer in the Armament Group. He was a technical illustrator in the Standards Group before moving on to the Saturn II, Apollo and Space Shuttle programs. He retired from Space Division in 1981 with 29 years of service.

LOST SHEEP, BULLETIN RETURNED WITH NO FORWARDING ADDRESS

M. W. "JACK" BELL – RANCHO PALOS VERDES, CA

RICHARD L. "DICK" WEISS – BANNING, CA

NORTH AMERICAN AVIATION
RETIREES BULLETIN
P.O. Box 3797
Seal Beach, CA 90740

North American Aviation Retirees Bulletin
"Where The Best Never Rest"

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Photo courtesy of Lt. Col. Shad Reed

One of the highlights of the visit by North American Aviation technical speakers in April was the informal "Brownbag Lunch" with the faculties of the Aeronautical and Astronautics Departments. This year, because of class scheduling, only the Aeronautical faculty attended. Those in attendance included (left to right) Lt. Col. Devin O'Dowd, Dr. Aaron Byerley, Dr. Thomas Yechout, Lt. Col. Kurt Rouser, Lt. Col. Barrett McCann, Mr. Chuck Lowry, Dr. Russ Cummings – Department Head, Mr. Allen Lowry, Lt. Col. Tom Joslyn, Dr. Thomas McLaughlin, Lt. Col. Shad Reed and Dr. Michael Semper.

NORTH AMERICAN AVIATION
Retirees Bulletin
"Where The Best Never Rest"

Fall 2014

Inside:

F-107A – THE NACA CONNECTION by William Simone

COLONEL VERMONT GARRISON – "THE GREY EAGLE" by Larry Davis

NAA AT CAPE CANAVERAL AND KSC PART VIII by Bill Edson

NAA KSC MEMORIAL BENCH ACCOUNTING by Ed Rusinek



Larry Davis collection

With a combined score of 55 MiG kills, five pilots from the 4th Fighter Interceptor Group stand in front of James Johnson's F-86 at Kimpo AB, Korea. From left to right, Capt. Lonnie Moore (10), Maj. Vermont Garrison (10), Col. James K. Johnson (10), Capt. Ralph Parr (10), and Maj. James Jabara (15). Jabara was the first Jet Ace in Korea.

NORTH AMERICAN AVIATION
Retirees Bulletin

North American Aviation Retirees Bulletin, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAA Retirees Bulletin can be contacted at The Boeing Company, Seal Beach facility by phone at (562) 797-3836. Send mail to:

North American Aviation Retirees Bulletin
P. O. Box 3797
Seal Beach, CA 90740

NAA RETIREES BULLETIN VOLUNTEERS
(562) 797-3836

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Dear NAA Retirees Bulletin Subscriber

As we enter the third quarter of the year, we look back and see that we have accomplished quite a bit in less than two years. We have delivered three North American Aviation Memorial Benches at three national locations where North American Aviation played a significant role in the defense of this Nation and where we had a significant role in making this Nation first in Outer Space. None of this could have been accomplished without the encouragement and support of you, our readers. We still have some funds left and we are in the process of seeking a location for a fourth Memorial bench.

In this issue, Bill Edson is back with another segment of the role North American Aviation had at the Kennedy Space Center. From the early days at Cape Canaveral to the final hours of the Kennedy Space Center we were represented by the finest group of engineers and technicians that the world had ever seen. We lost three splendid astronauts on the pad and two whole crews aboard the Space Shuttle. We lost some of our technicians and engineers in the preparations for launch but we never stopped in achieving our objectives.

Also in this issue is Mr. F-107, Bill Simone. Only three of these fantastic air-superiority airplanes were built but with government political leadership we lost out the production contract to the Republic F-105. The F-105 was used in battle for a purpose it wasn't designed for and many were lost over Vietnam. Bill saved the first F-107 from the scrap pile and saved it for all future generations to admire it in an Airplane Museum in Arizona.

Finally, we have Larry Davis back to tell us about a very unusual double-ace pilot who during World War II was rejected by the United States Army Air Forces only to be welcomed back two years later as an Ace in the RAF. A few years later, he became the "Grey Eagle" and again was a double-ace flying the North American Aviation F-86 Sabre.

Final Sad News: We tried to contact our North American Aviation Engineer/Historian Norman Avery at the assisted living facility in Agoura Hills, California where he lived to be near his disabled wife. We were informed that he passed away in 2013. We'll miss you Norm!

"Politicians are the same all over. They promise to build a bridge even where there is no river."

— Nikita Krushchev

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F-107A – The NACA Connection

by William J. Simone

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The F-107A – Introduction

North American's oft-forgotten F-107A remains perhaps the most enigmatic of the famous early "Century Series" fighters. The enigma stems from the fact that it was an outstanding and extraordinarily effective warplane and was, perhaps, the best airplane in the world for its particular job at the time of its 1956 first flight. Mysteriously, it was never to go into production, even in light of its superior capabilities. The F-107A-1-NA scored several firsts. Among them were a truly unique flight control system, an advanced inlet system, and the incorporation of a semi-submerged store. It was also the last of a long line of North American fighters to be built.

The NACA Connection

Early in 1957, the National Advisory Committee for Aeronautics (NACA) had expressed interest in obtaining use of the F-107A for high-speed flight research. NACA areas of interest included the vertical stabilizer system, the spoiler-slot-deflector system, the longitudinal control system, the variable air inlet duct system (VAID) and the buzz sensor system. It was estimated that the NACA program would take approximately 2 years to complete and would require a total of approximately 175 hours.

On May 3, 1957, a meeting was held at the North American Flight Test Center (NAFTC), USAF Plant 42, Palmdale, California to establish the configuration that was to be delivered to the NACA High Speed Flight Station (HSFS), Edwards AFB, California. It was decided that the first F-107A aircraft, 55-5118 would be delivered to NACA after the aircraft was brought up to the latest configuration. Mr. Cooper Lindley, NAA NAFTC was assigned to oversee the work.

A large number of items were addressed, the most important of which was spares. Since the F-107A manufacturing was limited to only 3 aircraft, spare parts were very limited. This was also true of the YJ75-P-11 engine, with only nine built by Pratt and Whitney. The instrumentation in the external centerline 500-gallon drop tank would remain with the aircraft.

Possible NACA use of the F-107A flight simulator was also discussed. The simulator would be used to refine the advanced F-107A flight controls and check out possible NACA modifications to them.

NAA agreed to have a specific configuration established by May 13, 1957. It was planned that the first F-107A, 55-5118, would go to the HSFS first, with the number three aircraft, 55-5120, to follow in about 6 months after completion of the 47-hour VAID test program. The number two aircraft, 55-5119, was scheduled for a very short store drop program after which it would be used for salvage purposes to support NACA.

On May 8, 1957, it was agreed that available spares from the original F-107A 400 flight test program would be divided equally between the NAA and NACA flight test facilities. There was a total of eight engines available for the F-107A, three of which were installed in the aircraft, one was available as a built up spare, two were at Pratt and Whitney for overhaul, and two were at San Antonio. The one built up spare engine was transferred to NACA. NAA agreed to make available the engine installed in the number two aircraft as a standby spare. At the conclusion of the NAA program, NAA agree that the remaining engines would to be transferred to NACA.

Furthermore, it was agreed that NAA would provide maintenance, repair and overhaul of some special components since HSFS was not equipped nor qualified to perform such work. Overall maintenance on the aircraft would be done by NACA personnel. This would prove to be a major source of problems since the Air Force had canceled the writing of the technical manuals on September 19, 1956.

On July 18, 1957, Air Materiel Command approved the North American Aviation proposed delivery configuration for F-107A serial number 55-5118. The cost to configure the aircraft as desired by the HSFS was approximately $80,000. The actual delivery of the aircraft was delayed because of the start of the new fiscal year and its associated money problems. It was estimated that work would start in mid-August.

55-5118 was officially delivered to NACA High Speed Flight Station on November 6, 1957 by U.S. Air Force Major Clyde Good. Major Good was assigned to the NAA Los Angeles plant as the Air Force Acceptance Pilot. During this flight from NAFTC to the HSFS, Major Good performed the Air Force acceptance flight, officially accepting the aircraft during the flight.

The delivery to the HSFS was not without problems, for shortly after engine shutdown the left main gear tire caught on fire because of a hot brake. No one was injured and the aircraft was not damaged except for the tire.

On November 21, 1957, the first F-107A, serial number 55-5118, was transferred to NACA by the ARDC. On December 10, 1957, NACA Headquarters assigned NACA 207 to the aircraft and ordered that the Air Force serial number and markings to be removed from the aircraft and the NACA insignia and serial number applied.

The vertical tail was repainted with the 207 call sign and yellow band with the NACA logo. The U.S. Air Force markings were removed from the inlet, but the star and bars on both the fuselage and wings were retained.



Clinton Johnson, DFRC Public Affairs Office, Edwards AFB

The first F-107A, S/N 55-5118, was officially delivered to NACA High Speed Flight Station (HSFS) on 6 November 1957 by U.S. Air Force Major Clyde Good. Greeting Major Good is NACA Bob Allen, Sr.

NACA pilot John B. "Jack" McKay was assigned as project pilot. Prior to becoming the F-107A Project Pilot, McKay flew experimental aircraft such as the D558-1, D558-II, X-1B and the X-1E. He also served as a research pilot on flight programs involving the F-100, F-102 and F-104. McKay would be one of the first pilots assigned to fly the X-15.

Four research flights were accomplished during the period of time 55-5118 was at the High Speed Flight Station. Maneuvers performed during these flights consisted of directional pulses and sideslips at altitude of 35,000 feet from Mach 0.9 to Mach 1.30. A more extensive original flight plan to investigate the lateral, directional and longitudinal stability, with and without control augmentation was not completed on any of these flights due to aircraft system malfunctions during flight.

Flight Number 1 took place on November 18, 1957. Operation of the Augmented Longitudinal Control System (ALCS) during the flight was unsatisfactory and the 17th stage gear case pressure gauge indicated zero pressure.

Flight Number 2 was aborted on February 27, 1958 when a malfunction of the fire warning system occurred. During taxi back to the HSFS; the left main gear brake caught fire, damaging the aircraft.

Flight Number 2 was reflown on April 9, 1958. During the flight, AC electrical problems developed shortly after takeoff.

Flight Number 3 took place on April 11, 1958. Operation of the Augmented Longitudinal Control System (ALCS) during the flight was unsatisfactory. ALCS became inoperative during pulses thus giving the aircraft an apparently nose heavy attitude.

Flight Number 4 was flown on June 25, 1958. Near the completion of the flight the canopy light came on, indicating that the canopy was not properly closed, and the cabin pressure decreased.

All problems, except the overheating brakes, were caused by electrical connector problems. Most of these problems could have been avoided if the aircraft had been maintained by NAA NAFTC personnel who were trained to maintain the aircraft. Also the lack of spare parts was already beginning to impact the test program.

Excessive heating in the brake wheel unit, during taxi, resulted in five tire and wheel failures, and in one case, a fire and subsequent damage to the left main gear, flap and external centerline 500-gallon fuel tank. To decrease the probability of future tire and wheel failures, thermocouples were installed on the wheel brake units and connected to temperature gages in the cockpit. This allowed the pilot, by observing the temperature gages, to control his usage of the brakes and keep the wheel brake unit temperature below the danger level. This, however, did not completely eliminate the problem. The F-107A always suffered from brake chatter and the brakes could be easily overheated if care was not taken, but the wheel brake overheating and wheel brake/tire fire problems were new, being only experienced by NACA. Other aircraft, such as the B-58, developed during this period, suffered similar problems with their brakes.

The third F-107A, Serial Number 55-5120, was loaned to the HSFS, being ferried from NAFTC by J. O. Roberts on February 10, 1958. It was a much more capable aircraft then 55-5118, and was equipped with a fully automatic VAID system. As a result, the first aircraft was returned to NAA, being ferried back to NAFTC on June 25, 1958 by McKay.

The third F-107A was never to receive a NACA number since it was only loaned, not transferred to NACA. 55-5120 retained the Air Force serial number, but received the yellow band with NACA (it was later changed to NASA) logo on the tip of the vertical tail. After a period of time, the U.S. Air Force markings were removed from the inlet, but the star and bars on both the fuselage and wings were retained. For a short time "North American F-107A" remained on the nose, but a short time later the words "North American" would also disappear.



Clinton Johnson, DFRC Public Affairs Office, Edwards AFB via William J. Simone

The first F-107A was officially delivered to NACA High Speed Flight Station on 6 November 1957 by Major Clyde Good. Major Good was assigned to the NAA Los Angeles plant as the Air Force Acceptance Pilot. During this flight from NAFTC to the HSFS, Major Good performed the Air Force acceptance flight, officially accepting the aircraft during the flight.

In March 1958, it was decided to install a side-stick (or side-arm) controller on the third F-107A and transfer all research work to this vehicle. The side-stick control to be tested was to be installed in the X-15 the following year.

In May 1958 work was started to modify 55-5120 to test this device. The side-stick controller was installed on the right hand console. The center stick remained in place, with the side stick controller being selectable with the flip of a switch. At this time, the aircraft was redesignated JF-107A, the "J" prefix meaning that the aircraft was temporarily modified.

Pilot evaluation of the side stick in the F-107A contributed significantly to the development of the X-15 control system. Testing of the side-stick controller proceeded at a fairly rapid pace, as Ship 3 proved to be very much more reliable than Ship 1. Problems were encountered with ALCS, VAID and the Yaw Damper, but at a much lower rate than before. Again, these problems, for the most part, were caused by electrical problems: the root cause being the wire connectors. The lack of spare parts and maintenance manuals did not help.

McKay noted as early as the first flight of 55-5120 that the brake problems experienced on 55-5118 were not evident. Based on the available NACA pilot reports, it appears that this issue never returned during the NACA test program.

A review of NACA pilot reports years later, showed that ALCS was experiencing problems as the flights progressed. There are several remarks in the reports that clearly show that with ALCS ON rotation for takeoff (unsticking) was taking a greater aft stick force. But this warning was to go unnoticed until the 42nd flight.

On August 1, 1959, at the beginning of what should have been a routine pilot checkout flight, the second accident of the F-107A program occurred. Scott Crossfield, the pilot at the time of the accident, describes it thusly, *"I attempted the last F-107 flight and damaged it by fire. It was probably 100 percent pilot error though I resist that conclusion. Apparently, I had misunderstood the takeoff stabilizer trim setting or I set it incorrectly in error, or I am weak in the arms. I attempted takeoff east on the lakebed from the NASA ramp. At what should have been unstick speed to lift the nose wheel, I felt I was pulling upwards of 50 pounds and it just wouldn't rotate. I did not horse it off because that can be bad news if it diverges. As warned, and as you could expect, the nose wheel tires blew and I aborted the roll out. Also, as expected with that airplane, the test tire on the left truck blew as l was rolling to a stop, I had used some brake but really little as the east edge of the lake came up and I turned north to parallel the shore line with brake and blown nose wheels.*

"As it was coming to a stop, the left truck caught fire and I called the tower for the fire engine; but they couldn't seem to find me. To keep the fire away from the wing tanks I kept taxiing until the left gear was just a stump. I managed to keep it moving but couldn't stay into the wind because of the shoreline. As I came about, the engine ingested the black smoke from the burning tire and the pressurization system dumped it all into the cockpit and I went on instruments. Fortunately, the tanks didn't catch but I believe that the airplane was 86'ed for overheated structure! I've always tried to be honest with myself about flying, but to this day I do not know why I could not rotate that airplane. Paul Bickle suggested that I take flying lessons to learn the fundamentals but that was the best answer he had too. To my knowledge, that was the last F-107A flight ever made."



Clinton Johnson, DFRC Public Affairs Office, Edwards AFB via William J. Simone

The second accident of the F-107A program occurred on 1 August 1959, at what should have been a routine pilot checkout flight. Scott Crossfield was the test pilot at the time of the accident.



Clinton Johnson, DFRC Public Affairs Office, via William J. Simone

The F-107A rests near the east edge of the Rogers Dry Lake. Note that Scott Crossfield had deployed the drag chute in an attempt to slow down the aircraft. Examination of the horizontal stabilizer shows that it is at the proper setting for takeoff.

I spoke to Mr. Crossfield several times on this subject over the years. Based on my knowledge of the aircraft, and my experiences in flight testing, I believe that this accident was not caused by pilot error, but most likely caused because ALCS was not engaged or had disengaged during the takeoff roll, or a failure in ALCS in a mode that was believed to be impossible had occurred.

The increase needed to rotate had been noted during a number of NACA flight on 55-5120. LCDR F. S. Petersen commented, *"The takeoff on this flight [Flight Eleven] was accomplished without any longitudinal oscillations. However, the pilot still feels that the aft stick force required at liftoff is excessive."* On the 19th Flight, LCDR Petersen again stated, *"ALCS was engaged prior to takeoff and remained on during the climb to test altitude. This portion of the flight was uneventful and the airplane appeared normal with the exception that the pilot felt that more back stick and force were required for nose wheel liftoff than was previously required with ALCS engaged."*

With ALCS disengaged, stick force to rotate the F-107A was higher than desired. The most likely cause is that ALCS had indeed malfunctioned, and was not engaged. Since no accident board was convened and no accident report filed on this incident, we will never know for sure what happened.

The aircraft was damaged during the aborted takeoff, but far from destroyed. Photos taken at the time clearly show severe damage to the tires, but also show no blistering of the paint, so it is very unlikely that the structure was overheated. Furthermore, the aircraft was put on display during the 1960 Edwards AFB open house; clearly not destroyed.

In all, 55-5120 made 42 flights for the NACA between July 1958 and August 1959, for a total of approximately 23 hours. Five NACA Test Pilots had flown the aircraft. They included:

John B. McKay	23 Flights (plus 4 flights in 55-5118)
Joseph A. Walker	1 Flight
Lt. Cmdr. Forrest Petersen	14 Flights
Maj. Robert White	3 Flights
A. Scott Crossfield	1 Flight (aborted)

Data collected during NACA F-107A flights was used to develop flight control and engine inlet systems for such aircraft as the North American XB-70A, A3J, the Lockheed SR-71, the McDonnell-Douglas F-15, and the General Dynamics F-16.

55-5120 was returned to the Air Force on June 3, 1960. It was immediately put into outdoor storage.

About the Author: After graduating college, Bill was commissioned as a 2nd Lieutenant in the Air Force where he flew the T-43. Early in his career as an engineer he worked on the B-1A, Space Shuttle, F-5E/F, RF-5E, F-20, JPATS, U-2 and F-117 and a number of other programs. He has an extensive background in flight testing and is currently testing the Northrop Grumman B-2A as a flight test engineer.

His love affair with the F-107A began when his father, Joseph D. Simone, introduced him to this North American Aviation aircraft during a trip to the North American Flight Test Center, located at the USAF Plant 42, Palmdale, California. Out on the ramp sat this very unique aircraft, unlike any he had ever seen before.

Colonel Vermont "Garry" Garrison, "The Grey Eagle" – Double Ace In Two Wars

by Larry Davis

Born on October 29, 1915 in Mt. Victory, Kentucky, Vermont "Garry" Garrison attended Eastern Kentucky State University and returned home to Mt. Victory to, as he put it, *"Teach the 3Rs at the county school house."* However, in 1940, the flying bug bit him hard and he joined the U.S. Army Air Corps as a Flight Cadet. Unfortunately, the bug wasn't enough and he was washed out.

He headed back home to Mt. Victory but then heard that the Royal Canadian Air Force was accepting personnel for flight training in the RAF, then heavily embroiled in the Battle of Britain. Upon graduation from RCAF training, Garry Garrison went to England where he was assigned to No. 133 Squadron, one of the American Eagle Squadrons.

On September 29, 1942, all three Eagle Squadrons were transferred from the RAF into the U.S. Army Air Forces as the newly formed 4th Fighter Group stationed at RAF Debden. Pilot Officer Garrison stayed with the RAF until July 1943 when he was commissioned a 1st Lieutenant in the USAAF. He was now a pilot in the same service that had washed him out just two years earlier. Garrison was assigned to the 336th Squadron at Debden in the new 8th Air Force.

By March 1944, he had shot down a total of 8 ⅓ German aircraft, becoming an "Ace" on February 6, 1944. Returning from the first 8th AF mission to Berlin on March 3, 1944, after shooting down another three German fighters; Garrison, himself, was shot down over France and crashed on the beach. His total at that time was 11 ⅓ victories, making him one of a handful of men to make "Double Ace."

He was a POW for the next year before being liberated by advancing Soviet forces in May 1945. Following repatriation and, subsequent, return to the U.S., Garry Garrison was reassigned to the newly reformed 4th FG at Selfridge Army Air Base, Michigan. The 4th Group transferred to Andrews AFB, Maryland in August 1947, just in time to make the transition into jets in the, then new, Lockheed P-80 Shooting Star.



Larry Davis collection

Lt. Vermont Garrison, 4th Fighter Group, Debden, England in 1943. Garrison would score 11 ⅓ victories before being shot down and taken prisoner in March 1944.

Garrison established a name for himself throughout his early career with the 4th FG (Jet), as a member of the first aerobatic team representing the United States Air Force which had been reformed in October 1947. On May 15, 1948, he flew a special bag of mail from Andrews AFB to LaGuardia Airport to celebrate the 30th Anniversary of the introduction of Air Mail. And when the 4th Fighter Group made the transition to the North American Aviation F-86A Sabre, Capt. Garrison had a major role, becoming one of the members of the Silver Sabres aerobatic team that performed at the 1949 Gunnery Meet at Las Vegas AFB, now Nellis AFB.

Now a major, Garrison was transferred to the 3596th Training Squadron at Nellis in 1950, as Squadron Commander. Known as the "Cadillac Squadron", the 3596th was responsible for getting the new jet fighter pilots ready for combat. In November 1950, Garrison's former unit, the 4th FG, was sent for "a short TDY to a theater of operations in a temperate climate." That "temperate climate" was South Korea!

For the next two years, Garrison trained fighter pilots that went off to combat. Many of his trainees went to Korea and became aces in the all-jet war against the Soviet MiG-15. Finally, in October 1952, after much cajoling and pleading, Major Garrison rejoined his old unit, the 4th FIG based at K-14, Kimpo AB, South Korea. *"It feels good to be back again. I like being a fighter pilot. I like jets, and I'll keep right on being a fighter pilot. It's all I know!"*

The *"Grey Eagle,"* as he was known to the younger pilots at K-14, was back. And the MiG pilots would learn he was there with a purpose. He was CO of the 335th FIS, the highest scoring squadron in Korea. On December 17, 1952, he got his first credit when he damaged a MiG over the Yalu. He scored his first MiG "kill" on February 21, 1953. And on June 5, 1953 he made Ace when he shot down two more MiGs.



Larry Davis collection

Capt. Vermont Garrison, 4th Fighter Group at Andrews AFB in 1949. The 4th FG received brand new F-86A Sabre aircraft in May 1949. The North American Tech Rep was John Henderson.

"On the afternoon mission, we were ready for a fight even if the MiGs didn't want one. I had four MiGs to my credit and I wanted that fifth one. We set up for a typical MiG Sweep of the Yalu River area. We were Yellow Flight, and I was Yellow Lead.

"We proceeded north to the Yalu and found no MiGs on OUR SIDE of the river. So, at a signal from me, Yellow Flight turned off the IFF beacons that told our radar on Chodo Island where we were at, and I took the flight further north towards Fengcheng Airfield, which was full of MiGs.

"We arrived over Fengcheng at about 45,000 feet. Looking down I observed about 30-40 MiGs taking off. 'This is too good to be true', I thought. I told my guys to 'Drop tanks!' *and we peeled off and headed down towards the MiG base. As we passed through 20,000, I noticed another 15-20 MiGs orbiting the field at our altitude, undoubtedly to provide top cover for those taking off.*

"We continued down at a very high rate of speed, right near Mach 1. I leveled off behind a pair of MiGs at about 500 feet behind the nearest MiG. Due to our speed, my closure rate was terrific. I fired a long burst, scoring hits all over the MiG, and he blew up right in my face!



Larry Davis collection

Col. James K. Johnson (left), CO of the 4th Fighter Interceptor Group at Kimpo, and Capt. DeJarnette (right), congratulate Major Vermont Garrison for his fifth MiG victory in Korea on June 5, 1953.

"I immediately picked out a second MiG farther ahead and opened fire. My speed continued to let me close at a high rate. I hit the second MiG all the way in, pulled up over his right wing, and watched as he rolled over and crashed and exploded. I then observed a third MiG turning right, just ahead and low on the tree tops.

"I figured I was about out of ammunition as I told my wingman, 'Take him Harry, I'll cover you!' *Harry opened fire, hitting the MiG in the aft section. His tail came off and we watched as he crashed in the hills below. My other element had destroyed two more.*

"The 20 MiGs we'd gone through on our way down, were now streaming down on top of us. And they were pissed! I yelled for everyone to get out of there and take advantage of the few clouds nearby. With the speed we'd built up in the dive and attack, we were able to shake off the MiGs before we got back to the Yalu. We'd destroyed five MiGs in less than two minutes. The only damage to our flight was my aircraft that had suffered some hits from the MiG that blew up in my face. Nothing serious, however, and everyone made it back home without problems.

"The two MiGs that I shot down were my 5th and 6th, making me the 32nd Jet Ace in Korea. My crew chief had to expose the gun camera film as soon as we landed because there were some strange objects on the film – fire trucks, control towers, that type of thing. UFOs!"

On July 19, 1953, Major Vermont Garrison scored his last MiG kill. It was his 10th victory, making him a Double Ace, one of only six pilots to make Ace in two different wars, and one of only two pilots to make "Double" in two wars. He was promoted to Lt. Colonel in May 1955 and to full Colonel in March 1961.



Larry Davis collection

With no drop tanks and very dirty gun ports, Major Vermont Garrison returns to his parking spot at K-14, Kimpo AB, Korea on June 30, 1953 following his ninth MiG kill. He would add one more kill making him a Double Jet Ace.



Larry Davis collection

The "Silver Sabres" team brief on the right wing of an F-86A at Las Vegas AFB in 1949. From left to right, Lt. J.O. Roberts, Lt. Walter "Tex" Badger, Lt. Larry McCarthy, Capt. Vermont Garrison, and Lt. Col. Ben Preston.

When the Vietnam War heated up in 1964, PACAF transferred the 8th Tactical Fighter Wing to Ubon RTAB, Thailand under the leadership of the legendary WWII Ace, Col. Robin Olds. His Vice Commander was the "Grey Eagle", Col. Vermont Garrison. In January 1966, Col. Garrison took over command of the 405th TFW at Clark AB, Philippines. And on September 15, 1966, Col. Garrison retired from the Air Force after 23 years and three wars. He had a total of 21 ⅓ victories. Among the many decorations Col. Garrison was awarded include two Silver Stars, three Distinguished Service Crosses, nine Air Medals, and a Bronze Star.

The "Grey Eagle" folded his wings on February 14, 1994 at his home in Mountain Home, Idaho.

About the Author: Larry Davis is a retired Canton City Fire Fighter. His writing credentials include a large number of books for Squadron-Signal Publications, Specialty Press, Cartech Books, and many aviation-oriented magazines throughout the world. At present, he is the editor of SabreJet Classics *magazine, the media arm of the F-86 Sabre Pilots Association. He lives in Canton, Ohio with his charming wife, Susan. His daughter recently received her Masters Degree in Education and is employed by the New York City School System.*



Larry Davis collection

Major Vermont Garrison in the cockpit of his F-86F in early 1953. Major Garrison was the CO of the 335th FIS at Kimpo in 1953.

NAA at Cape Canaveral and KSC – Part VIII

by Bill Edson

Prologue

The prime purpose of this series *"NAA at Cape Canaveral and KSC"* is to identify the role that NAA played during the early years of the U.S. Space Program at the White Sands Missile Range in New Mexico, the Mississippi Test Facility along the West Pearl River in Mississippi and at the Cape Canaveral and Kennedy Space Center (KSC) industrial and launch facilities in Florida. The timeframe under discussion, from the end of WWII in 1945 to the early 1980s has been one of evolution, technological development, manufacture and test of early rockets, ballistic missiles, satellites and spaceships. From the late 1950s into the early 1960s, the Apollo Program was conceived, developed and implemented with the goal of landing a human on the moon, and of achieving superiority in space. In order to provide a better understanding of the development and expansion of our U.S. space activity over the years, I have provided, to each part where applicable, a discussion of the technical, operational, and political history that preceded us and, subsequently, led to many of our successes. In past articles, my focus has been oriented towards our NAA team stationed at KSC and on its performance. In Part VIII, I've chosen to direct our attention toward our support teams generally manned by NASA employees or by other contractors. A major intent of Part VIII of this article is that we recognize each of the "behind the scenes" operational support teams that made it all happen when it had to happen.

Early Days of the Cold War Post-WWII

The scenario regarding the early days of the "Cold War" identified many roadblocks and/or challenges that we would face as we entered a new technological era. During the 1950s, the challenges that we experienced included "Cold War" conflicts with the Russians, a McCarthy era of political repression against communism (i.e., an unpopular opinion), imposition of a Berlin blockade resulting in a U.S. airlift and international conflicts with Cuba, Korea and Vietnam. On the home front, we faced an inner military rivalry with each branch of the military competing among themselves for control of aerospace design responsibilities. The new era we entered in the mid-1950s introduced us to advanced research programs that offered unique aircraft and missile design and manufacturing concepts (e.g., Navajo, Thor, Atlas, X-15, Hound Dog, Titan and Polaris, etc.). Each of the individual challenges brought with it an element of insecurity and a lack of trust in the Russian life style and their form of government. In 1955, NAA experienced a major corporate restructure that established the Downey Space Division, the Rocketdyne Engine System Division and the Autonetics Electronics Division. The Russian launch of Sputnik 1 on October 4, 1957 came as a major shock to the U.S. Government and to the American people. We worked feverishly through the middle of the next year to develop a recovery plan. In July 1958, as a consequence of the Russian Sputnik 1 activity and at the direction of Congress, NASA assumed control of the U.S. civilian space program. The response of the American people initially showed ambivalence but over the next two years the changes were recognized across the country as both dramatic but necessary. These changes were discussed in the *"NAA at Cape Canaveral and KSC"* Parts VI and VII.

Challenges in Transitioning From NACA to NASA

The transitional period from the National Advisory Committee for Aeronautics (NACA) organization to the new National Aeronautics and Space Administration (NASA) organization in 1958 was one that dictated clarification of its goals and objectives, an identification of its governmental interfaces, a definition of its authority and responsibility and confirmation that it had the support of the entire country. The transition dictated an evaluation and re-structure of their internal organization, and an extensive build-up of their facilities, technical capabilities and supporting manpower to ensure its accomplishment. Essential to the needs of NASA was the development and implementation of near term and long range program plans and schedules consistent with the goals and objectives of the National Space Act. The new NASA long range responsibilities, goals and objectives were identified and approved in general terms in the enabling legislature of the National Space Act in July 1958. The legislation stated that it would be the responsibility of the NASA to conduct aeronautical and space activities so as to contribute materially to the national objectives. The Space Act went on to say that the objectives could only be attained by a broad and soundly conceived program of flight oriented research, development and of space operational activity that would make feasible the manned exploration of the moon and of the nearby planets. As new projects came on-board they were slowly integrated into the "big picture". In mid-1959 the Saturn launch vehicle configuration was approved for design and development in support of the Apollo Program.

Astronaut Qualification, Selection and Training

NASA assumed its new responsibilities in early October 1958. Project Mercury was authorized by Congress on October 7, 1958 and in December 1958, NASA posted civil service notices inviting applicants to compete for astronaut service jobs at levels GS-12 to GS-15 which paid salaries of up to $12,700 per year. At that time, President Eisenhower believed that existing military test pilots could provide all the astronauts required by the U.S. Space Program. When faced with the prospect of recruiting the first group of astronauts in 1959, NASA requested that each facet of the U.S. military identify members of their respective branches who met specifically identified qualifications and who also had aspirations of becoming an astronaut. With that move, the search was underway for personnel to participate in the new and exciting manned space flight program. The initial selection criteria for an astronaut identified the requirement for jet aircraft flight experience and engineering training, and it tailored physical stature requirements to the small cabin space available in the Mercury capsule then being designed. It was mandatory that each candidate be a qualified jet pilot and a graduate of test pilot school with at least 1,500 hours of flying time. When over 500 men were found qualified per the criteria, military and medical records were further examined and evaluated. As a consequence, extremely difficult written, physical and psychological tests were given to each candidate before the initial seven Mercury astronaut selectees were identified. On April 9, 1959 the "Mercury Seven" candidates were chosen to be our first astronauts.

The astronauts assigned to each manned mission received up to ten hours of formal crew training in specific areas for each hour of their flight. They participated in spacecraft manufacturing checkout at the home plants of North American in Downey, California and of Grumman in Bethpage, New York. The highlight of their crew training included briefings on the spacecraft and launch vehicle, on the countdown, range safety and on abort conditions. Special training was provided with the end goal of meeting mission photographic objectives. Many hours were consumed by the review of flight procedures and checklists and in flight simulations and stowage exercises in spacecraft simulators both at KSC and at the Manned Spacecraft Center (MSC, now Johnson Space Center, or JSC) in Houston, Texas. Command Module (CM) egress training in the Gulf of Mexico and on the launch pad was a high priority. Of great significance was their support to the processing flow test operation at KSC. Flight crew training for each mission was quite extensive and very intense. Classroom training focused on rocket engines, flight mechanics, computer theory, astronomy and geology. Survival training was accomplished at both desert (hot) and mountain (cold) environmental locations. Safety training utilizing recovery procedures was obtained at MSC and at Gulf of Mexico locations while emergency egress slide wire training was made possible utilizing launch pads at KSC. Flight operation of the Lunar Landing Research and Training Vehicles provided an opportunity for flight crew members to experience Lunar Module (LM) handling characteristics and a lunar descent profile while training on those vehicles. Extensive geological "hands on" training was provided while on field trips to unique geological locations both within and outside the continental U.S. The majority of crew training accomplished in both Command/Service Module (CSM) and LM flight simulators located initially at KSC (phased out in the mid-1960s) and at JSC where mission simulator training continues today on other programs. Each crew member assigned to a mission received specific simulator training for his individual part of the mission and for aborts including potential emergency conditions as envisioned by the mission planners or by flight crew members. Members of each of the flight crews were involved in "hands on" testing of flight hardware at the CSM and LM factory manufacturing locations and at KSC. At KSC, involvement of members of the flight crews was considered mandatory in support of Manned Spacecraft Operations Building (MSOB) altitude chamber testing, and launch pad Flight Readiness Tests and the Countdown Demonstration Test.

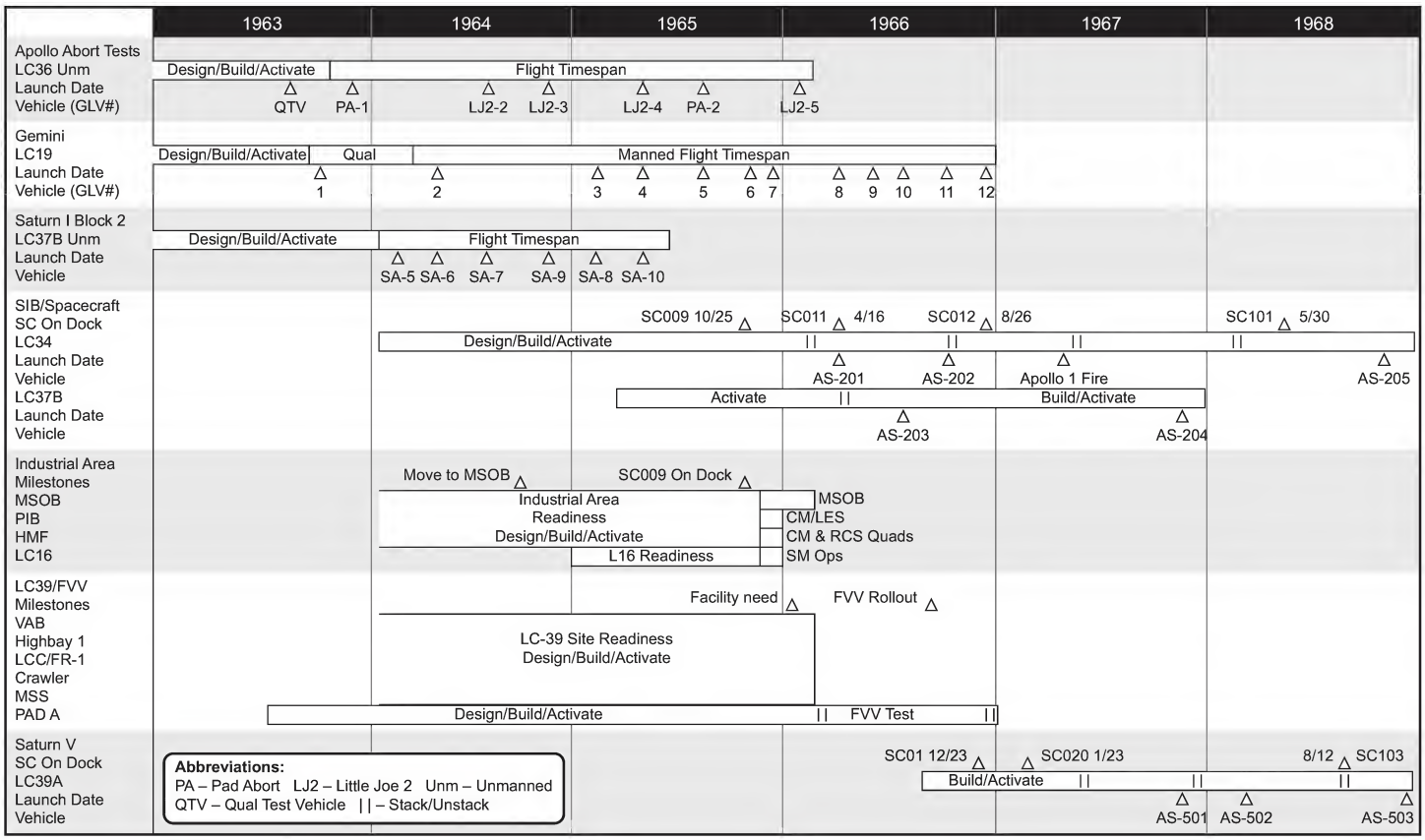
Apollo Flight and Ground System Configuration

In mid-1961, NAA was contracted by NASA to design, build and test the Apollo spacecraft and the S-II second stage of the Apollo launch vehicle. Shortly afterwards, NAA was placed under separate contract to the NASA to support site activation and the operational processing and launch of the applicable vehicle stages and the Apollo spacecraft. In late 1961, construction of manufacturing, test and launch facilities to process Saturn hardware was initiated.



Photo from the Bill Edson collection

Apollo 7 Backup and Prime crew astronauts attend a design review at NAA's Space Division facility in Downey, California. Seated from left to right are Astronauts Gene Cernan, John Young, Tom Stafford, Walt Cunningham, Donn Eisele, and Wally Schirra.



Space Vehicle Design/Build/Flight Test Schedule

Astronaut Flight Responsibilities

Deke Slayton, one of the original seven Mercury astronauts, was appointed to lead the astronaut office in Houston in 1962 when he was grounded by a heart murmur which disqualified him from space flight at that time. In 1963, Deke was appointed Assistant Director of the JSC flight crew operations directorate. In this role he was responsible to assign Gemini and Apollo flight crew members to their respective missions. The flight crew selection procedure adopted by Slayton identified a prime crew to fly a mission, a backup crew to take its place if the need arose and a support crew to keep the prime and backup crews abreast of technical and operational developments while releasing them from mundane but necessary day-day affairs. Typically, members of the support crew were junior astronauts who, by virtue of their late arrival at NASA were not yet prepared to receive immediate crew assignments. Much of their work initially was "paper oriented" (e.g., flight plans, mission rules, operational procedures and checklists, etc.) in preparation for their involvement with flight hardware. Slayton considered all astronauts to be equally capable of flying any mission although each astronaut was assigned to specialize in different aspects of the mission (e.g., mission planning, rendezvous techniques, extra-vehicular activities, etc.) which made them more suitable for specific flights. A crew selected as backup could be expected to become the prime crew three flights later. However, that situation did not always work out that way. The manned Apollo missions carried three astronauts, designated as Commander (CDR), Command Module Pilot (CMP) and Lunar Module Pilot (LMP). Besides exercising all flight crew command decisions, the CDR was the primary pilot of both CSM and LM spacecraft (when present) and was the first to exit the LM on the surface of the moon. The CMP functioned as navigator, usually performed the initial docking with the LM, and remained in the CSM when his companion flew the LM. The LMP functioned as engineering officer, monitoring the systems of both spacecraft. On a landing mission, he accompanied the CDR in the LM to the lunar surface. Mission rules specified that only one person in the Mission Control Center (MCC) would communicate with the flight crew. This normally was another astronaut who might better understand unique situations as they occurred in the spacecraft and consequently could communicate more clearly with the crew. These individuals were designated "capsule communicator" or CAPCOM, a term carried over from the Mercury and Gemini programs. The CAPCOM was usually chosen from the back-up or support crews, and he was a key member of the support team during major ground tests and/or flight missions.

Initial Lunar Landing Probe Activity

Lunar or planetary reconnaissance probes that landed in the targeted areas were classified according to their landing methods. The first lunar reconnaissance probes were intended either to pass very close to the moon (flyby) or to impact with it (hard landing). The primary mission of this type probe was to obtain environmental and photographic mapping data of the target areas. In early 1959, the Soviet Space Program took another step forward when Luna 1 became the first spacecraft to fly within the vicinity of the moon. Later that year, Luna 2 successfully impacted on the lunar surface. More advanced probes made low impact landings (soft landings) designed to protect the probe on-board systems at impact and to provide the capability to send TV and scientific data back to earth from the lunar surface. Included within that data in the mid-1960s was a description of the lunar terrain and information on the load bearing strength of the lunar

surface and on the composition of the lunar soil. Another class of probe was developed that had the capability to achieve a stable orbit around the moon. Each type of probe mentioned required increasingly greater rocket power and a more precise maneuvering capability. Throughout the 1960s, unmanned spacecraft launches intended to support lunar surface surveillance and subsequent exploration were strongly supported in as much as they would contribute directly to the success of the space programs identified. After the turn of the decade, a scientific Ranger probe, followed later by Surveyor and Lunar Orbiter probes in search of a lunar landing site became of great significance to the NASA as they contributed directly to the success of manned Apollo operations. Unfortunately, proponents of planetary investigation were forced to be content with relatively constrained budgets, limited personnel and little publicity.

Evaluation of Lunar Landing Site Selection Criteria

Early in the 1960s there was considerable concern expressed regarding our lack of knowledge of potential Apollo lunar landing sites. The only information available to the NASA scientists at that time regarding the conditions likely to be encountered on the lunar surface were from earth based telescopic observations and from remote radar sensing devices. Conjecture said that the surface might be too rough or too deep in soft dust to attempt lunar surface landings. There was much concern that during a lunar landing, exhaust from the lunar module descent engine would kick up dust on the lunar surface, and create a dust storm. It was believed that landings should be made where surface dust was the thinnest. Hard evidence was in short supply and more accurate data was required in order to positively influence the spacecraft design and the choice of specific landing sites. In the early 1960s, six Ranger probes, launched on Atlas-Agena rockets and designed to impact on the lunar surface and to obtain the first close up images of the lunar surface, failed and provided little information to the Apollo program. In the same time frame, studies of micrometeoroids and radiation hazards in space concluded that they would not be a significant Apollo program concern. In 1964-1965 three additional Ranger probes provided televised information that revealed craters caused by external impact as the dominant feature of the lunar surface even in the smooth and empty plains. Images received indicated that the lunar surface was relatively firm but that further evidence of its ability to support the weight of a manned spacecraft was required. Based on the knowledge existing in mid-1965, a NASA Apollo Landing Site Selection Board, assisted by a group of geological experts, was established within the Office of Manned Space Flight. This team identified a strip of lunar terrain approximately 185 miles wide centered on the lunar equator and 1,500 miles long and specified it as the Apollo Landing Zone (ALZ). Between 1966 and 1968 the NASA Surveyor Program, implemented by the Jet Propulsion Laboratory (JPL), sent seven robotic spacecraft on Atlas-Centaur launch vehicles to the surface of the moon. Five of the seven were successful in meeting their goals. The primary purpose of the program was to demonstrate the feasibility of soft landings on the moon. The Surveyor flights, utilizing TV cameras and remotely operated robotic soil samplers established that the lunar plains were formed from lava flows and, although they contained craters, were flat enough to provide clear landing areas. Large rock formations that had the potential of interfering with the flight vehicle landing radar were also identified in some areas. The surface material was found to be composed of dust and loose particles, but was sufficiently compacted to bear the weight of a manned vehicle. The Lunar Orbiter, developed by the Langley Research Center (LRC), provided direct support to the Apollo Program as a pathfinder for identification of additional potential Apollo landing sites. Five Lunar Orbiter missions were flown concurrent with Surveyor flights. The first three Lunar Orbiters were dedicated to imaging twenty potential lunar landing sites stretching along the ALZ. Photographic information and resultant topographical maps were provided by the first three Lunar Orbiters to the Site Selection Board. They, in turn, narrowed the list of proposed landing sites to five that could be used for the Apollo 11 lunar mission and to six sites for the second lunar landing mission. The criteria utilized for the lunar landing site selection for the Apollo 11 spacecraft dictated that there be: relatively few craters and boulders; no large hills, cliffs or craters that could cause incorrect attitude signals to the lunar landing radar; a minimum expenditure of LM propellants required; minimum schedule impact in the event of a countdown delay or scrub and recycle; use of a free return trans-lunar trajectory: and a landing site that offered less than a 2-degree slope to the approach path and landing site. To enable direct communications and maximum safety, all six piloted Apollo lunar landing missions were on the continuously earth facing side of the moon. The far side terrain was not well known and there were no relay satellites to allow continuous contact in the event of a far side landing. The Apollo landing sites were located relatively near the equator within the Apollo Landing Zone. A near equatorial landing was determined to be the most favorable for return to earth trajectories. Landings had to be made during the lunar day on the near side in a way that would be favorable for the particular launch and orbital configuration and that would allow alternate landing site selection in the event of a launch delay. This combination of factors restricted the number of possible landing sites. The Apollo 11 mission was targeted to land on smooth, flat mare surfaces deemed to have low numbers of impact craters. An eastern site was preferred for Apollo 11, which would leave a western site for backup, but too far to the east would require a night splashdown on the return to earth. Mare Tranquillitatis was the only suitable landing site.

Apollo Program Mission Support Plans

The success of the KSC Apollo launch activities would have been irrelevant had it not been for the contributions made by the numerous Apollo program mission support elements of the Apollo organization. The Mercury Project mission support activity was expanded significantly in support of the Apollo Program. Just as we had prepared ourselves at KSC to launch each vehicle, the mission support team, comprised of several thousand multi-disciplined personnel prepared themselves to support each mission from lift-off through splashdown and recovery of the spacecraft and its crew. While we at KSC had been processing flight hardware in preparation for each unmanned Apollo launch, members of the Apollo mission support team were in training to develop their skills in anticipation of the first manned Apollo launch. After the launch vehicle had cleared the launch umbilical tower, direct responsibility for the success of each vehicle reverted from the launch support team to a team of mission support specialists. Much like the launch team, the mission support team benefitted from their first-hand experi-

ence on Mercury and Gemini manned and unmanned flights and on Apollo unmanned flights as they were trained in their areas of expertise to ensure a safe flight and mission success. The mission support team was comprised of representatives of the Astronaut Office and the Landing Site Selection Board and four major elements of the Manned Space Flight Network (MSFN), NASA Communications Network (NASCOM), Mission Control Center (MCC) and the Department of Defense Manned Space Flight Support Office (DDMS). In the following paragraphs, I will briefly explain the function of each and the major role they played to ensure the success of the Apollo Program.

Operation of Manned Space Flight Network

With its origin in the ICBM tracking network which extended into the Indian Ocean, NASA established and developed throughout the Mercury and Gemini flights a sophisticated global tracking and data acquisition network to communicate with spacecraft in earth orbit. Communication with orbiting spacecraft was only possible while the spacecraft was passing over a station between its horizons. To resolve their concern, NASA developed the Manned Space Flight Network (MSFN), consisting of 14 worldwide ground stations, EC-135N Apollo/Range Instrumentation Aircraft (A/RIA, modified C-135 transports) and instrumented tracking ships. Up to 14 stations, placed in a belt under the proposed orbital ground track supplemented by the aircraft and ships filled the gaps where the spacecraft crossed the earth's major oceans. While extending the system around the earth, the MSFN provided reliable and almost continuous communication with the spacecraft. The MSFN tracking and data acquisition stations linked the flight controllers and engineers at the Manned Spacecraft Center (MSC) to the spacecraft. The A/RIA aircraft also tracked the Apollo spacecraft during the critical trans-lunar injection and reentry maneuver phases of the Apollo missions. The home base of the 12 A/RIA aircraft was at Patrick Air Force Base, a few miles south of Cape Canaveral. It was not unusual to see the fleet of A/RIA "snoopy" nosed aircraft lined up on the aircraft apron at Patrick AFB between missions. The A/RIA's 7-foot parabolic antennas were housed in the aircraft's nose. Both the ground stations and the tracking ships (which on occasion were located in Cape Canaveral harbor) were equipped with 30-foot communication dishes. For lunar operations, three 85-foot diameter communication antennas were placed at stations in California, Spain and Australia. At any time, at least one of these dishes would always have a direct line of sight with the moon and the spacecraft. Two additional dishes, one in California and one in Australia were brought in to support television transmission during Apollo 11's activities in space and on the lunar surface.

NASA Communications Network

To link the tracking stations, NASA developed its own global Communications Network (NASCOM). Operation of the network and the transmission of data to and from the spacecraft and the MCC in Houston was the responsibility of the Goddard Space Flight Center (GSFC) in Greenbelt, Maryland. Consisting of a combination of land lines, submarine cables, microwave links and three Intelsat communication satellites in geostationary orbit, NASCOM covered over three million miles. To improve the quality of transmission for the Apollo flights, all television, tracking, remote commands and voice transmissions to and from the spacecraft were handled by a single radio carrier wave through a new unified S-band system.

Apollo Mission Control Center

The Mission Control Center (MCC) located at the Manned Spacecraft Center in Houston became the focal point for all Apollo mission control activities in 1965. In the MCC and in remote stations around the world, teams of experienced engineers and technicians monitored spacecraft system consoles and activities 24 hours a day during Apollo flights. They were responsible for both the Apollo mission planning and for control of the flight operation. During the Mercury Project, capsules were controlled entirely from the ground at Cape Canaveral. The capsule's manual control system served in most cases as backup to the automated systems. As spacecraft became more complex in the Gemini years, dependence on the then new MCC in Houston was reduced. When distance and communication breaks on Apollo made it necessary, some on-board systems became primary, while others still relied on direction from mission control. The center received their tracking and telemetry data from the MSFN. This data was processed through the MCC computer complex and used to drive displays for the flight controllers and engineers in the mission operations control rooms and staff support rooms. The MSFN tracking and data acquisition stations linked the flight controllers at the center to the spacecraft. The MSFN consisted of 14 worldwide ground stations, A/RIA aircraft and instrumented ships. To support the Apollo lunar landing program, and to track and communicate with spacecraft in the vicinity of the moon, the MSFN installed Deep Space Network antennas at Goldstone, California, and in Australia and Spain. The remote network ground stations launch site and control and communication centers were connected through several million miles of communications circuitry of the NASA Communications Network. As many as 4,000 people were on duty during flight operations.

DOD Manned Spaceflight Support Office

The Department of Defense Manned Space Flight Support Office (DDMS) was formed in 1959 with the express purpose of providing support to our manned space effort with emphasis on putting people into space and returning them safely to earth. DDMS was the focal point of an effort that provided all Department of Defense contingency support to the manned Mercury, Gemini, Apollo, and Apollo-Soyuz Flight Test projects. The support included astronaut and space capsule recovery, worldwide communications, tracking and data relay, and logistical and medical support. Recovery operations were directed from the Recovery Operations Control Room in the NASA Houston MCC and were supported by four Atlantic and Pacific recovery control centers. At launch, a multitude of ships were on station in the launch abort areas and in the primary recovery area and to a lesser extent in secondary recovery areas.

About the Author: During his 34 years with NAA/Rockwell, Bill served on the Apollo, Space Shuttle and Space Station programs in a supervisory or management position. Half of that time was dedicated to launch operation on Apollo and Space Shuttle at KSC. He has endeared himself to our readers, especially those that served at KSC.

Accounting for NAA Memorial Bench at the Kennedy Space Center

by Ed Rusinek

Total Funds remaining for NAA Memorial Bench at the Kennedy Space Center ..$7,512.05

List of New Donors for NAA Memorial Bench at KSC

Name	City	Division Affiliation	Rememberance
Phillip Moy	Torrance, CA	S&ISD	In Memory of My Colleagues in the Engineering Mass Properties Groups
Roger Lawrence	Dolores, CO	S&ISD	In Memory of Ted Clauss, My Manager on the Shuttle Aft Fuselage Assembly
John B. Plowden	Fernandina Beach, FL	Rocketdyne	In Memory of My Colleagues on the Apollo-Saturn Program

Total Funds Available for NAA Memorial Bench at the Kennedy Space Center $7,762.05

Total Cost Paid to Dodds Monument, Inc. for KSC Bench $4,200.00

Total Funds Available for Future Project.....$3,562.05

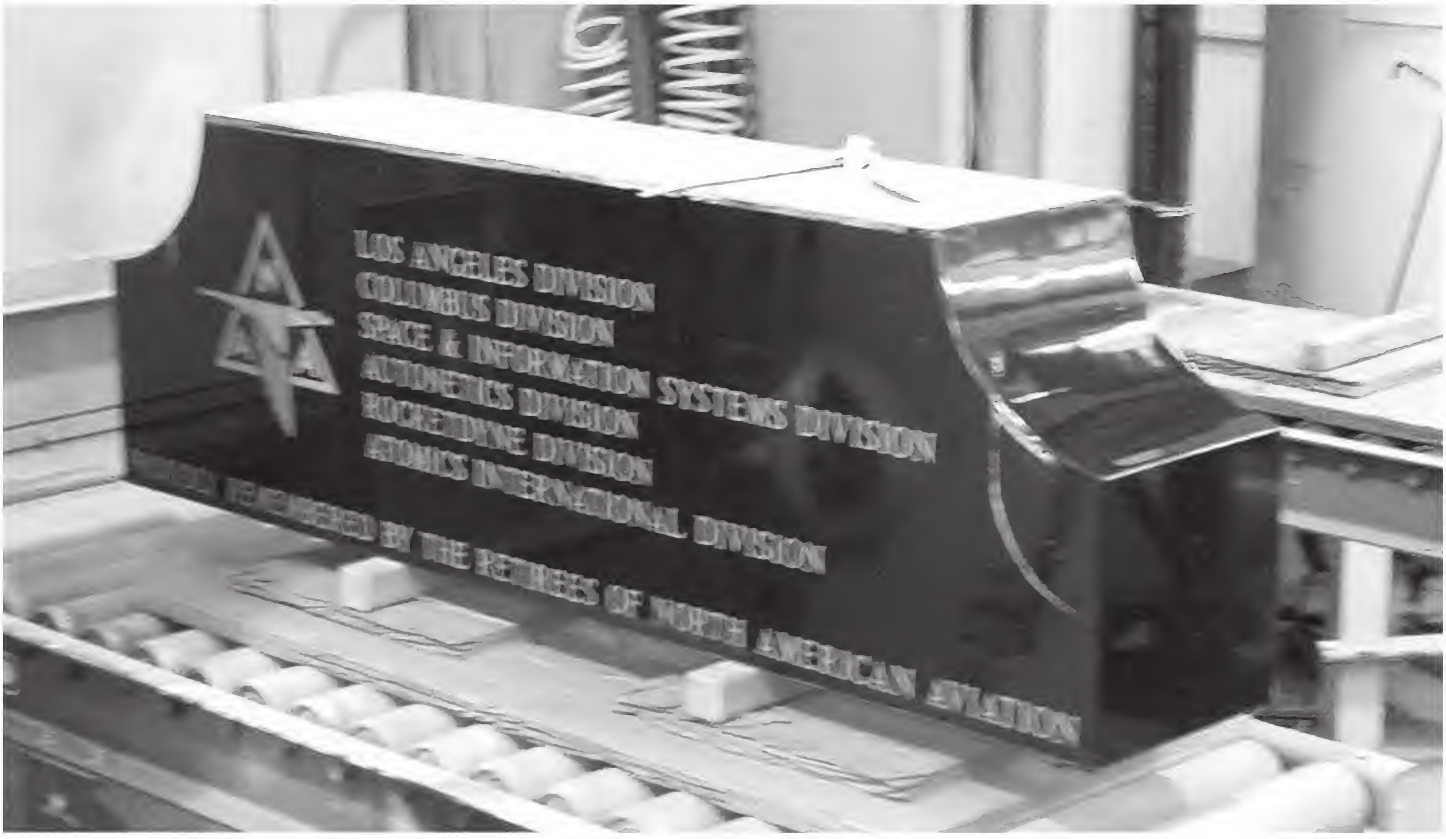


Photo courtesy of Larry Morrison, Dodds Monuments

The North American Aviation Memorial Bench for the Kennedy Space Center Visitor Complex during the process of laser etching and polishing at Dodds Monuments. The Memorial Bench has since been completed and delivered to the Kennedy Space Center in Florida.

Request for a Fourth Bench to be Located at the USAF Academy

NORTH AMERICAN AVIATION RETIREES BULLETIN
ED RUSINEK, EDITOR
11291 WEMBLEY ROAD
ROSSMOOR, CALIFORNIA 90720
EMAIL: KENISURE@SOCAL.RR.COM

JULY 8, 2014

DEAR MS DONNA MOHLER,

THANK YOU FOR THE INFORMATION YOU PROVIDED ME THIS MORNING REGARDING THE REQUIREMENTS FOR A MEMORIAL BENCH TO BE PLACED ON THE USAF ACADEMY CAMPUS GROUNDS. AS I POINTED OUT TO YOU. WE NO LONGER EXIST AS A COMPANY. ALTHOUGH WE HAVE PROVIDED THE FINEST AIRCRAFT AND SPACECRAFT FOR THE U. S. ARMY AIR CORPS AND THE U. S. AIR FORCE DURING WORLD WAR II AND ALL SUBSEQUENT CONFLICTS, OUR COMPANY CEASED TO EXIST SOME 50 YEARS AGO.

OUR B-25'S WERE THE ONLY BOMBER AIRCRAFT CAPABLE OF TAKE-OFF FROM A CARRIER TO TAKE DOOLITTLE OVER TOKYO. OUR P-51'S SAVED THE 8TH AIR FORCE B-17'S AND B-24'S OVER OCCUPIED EUROPE AND THE 20TH AIR FORCE B-29'S OVER JAPAN BECAUSE THEY WERE THE ONLY AIRCRAFT CAPABLE OF ESCORTING THE BOMBERS ALL THE WAY TO TARGET AND BACK. OUR F-86'S WERE THE ONLY FIGHTERS CAPABLE OF BESTING THE MIG-15'S OVER KOREA. THE LIST GOES ON. WE WERE WITH THE USAF ASTRONAUTS IN THE APOLLO AND SPACE SHUTTLE PROGRAMS. TODAY, WE ARE NOTHING MORE THAN THE NORTH AMERICAN AVIATION RETIREES BULLETIN AND SEVERAL THOUSAND RETIREES CAPABLE OF STILL REMEMBERING THOSE EXCITING MOMENTS IN HISTORY.

TODAY, WE HAVE BLACK GRANITE NORTH AMERICAN AVIATION MEMORIAL BENCHES AT THE USAF MUSEUM IN DAYTON, OHIO AND THE US AIR NAVAL MUSEUM AT PENSACOLA, FLORIDA. A THIRD BENCH HAS BEEN ORDERED FOR THE VISITORS CENTER AT THE NASA KENNEDY SPACE CENTER IN FLORIDA AND WILL BE READY IN AUGUST. WE HAVE NOTHING TO SELL. WE DON'T EVEN WISH TO BE REMEMBERED. HOWEVER, LIKE THE SPARTANS, WE WANT OUR ACHIEVEMENTS TO BE EVIDENT TO THOSE THAT COME AFTER US! GOD BLESS THEM ALL!

I AM ENCLOSING SEVERAL COPIES OF THE NAA BULLETIN WITH REFERENCE TO THE BENCHES I MENTIONED AND OUR CURRENT PARTICIPATION ON CAMPUS AT THE AERONAUTICS, ASTRONAUTICS AND PREP SCHOOLS. YOU MAY WISH TO CONSULT WITH OUR DESIGNATED HOST ON CAMPUS, LT COL KURT ROUSER, (719) 333-8489, REGARDING OUR ACTIVITIES. AGAIN, THANK YOU FOR THIS KINDNESS.

CORDIALLY YOURS,

ED RUSINEK, EDITOR (562) 431-6960

"Where The Best Never Rest"

Contrails From The Past

by Ed Rusinek

Dear Ed,

On September 1, 2014, my wife, Sandy, and I will celebrate the 50th Anniversary of our first date. Why am I telling you this? It is because of its direct involvement with the Autonetics Division. I was a draftsman in the Ground Support Equipment Group and Sandy was the librarian in the Engineering Library.

On that day in 1964, I received a phone call from my roommate who also worked at Autonetics and he was in a panic! He had purchased four tickets for the company sponsored bus trip and ballgame for that night and the other couple that had intended to go with him and his date had to cancel out. He asked me if I could get a date and take the tickets from him. I ran over to the Engineering Library and asked Sandy if she would like to go to a baseball game that night and she said, *"Yes."* We were married on June 19, 1965.

— Russell Monroe, Orange, CA

Ed's Ans.: This is the North American Aviation Retirees Bulletin, *not a Romance and Roses magazine. And next year you are going to ask me to congratulate you on your 50th Anniversary. Now, I am going to get a batch of letters from husbands telling me how they met their wives. Husbands – please no more romantic interludes about how you met the love of your life! Russell, we ran your letter because we are suckers for stories with happy endings!*

Dear Ed,

I am making a second contribution for the NAA Memorial Benches in memory of Ted Clauss. He was a great boss to work for. I was responsible for all the titanium drilling on the Wing Carry Thru Structure for the B-1A. Downey needed someone familiar with this assembly operation for the Thrust Structure on the Space Shuttle. That is how I got to work for Ted Clauss.

We did our job so well that on *Challenger* we put the Thrust Structure together with no defects. My crew got a Silver Snoopy for that effort. It was really Space Rated, Zero Defect Hardware.

— Roger Lawrence, Dolores, CO

Ed's Ans.: As I pointed out in response to Max, we were not extraordinary people but we performed extraordinary deeds with a certain panache that has never been seen before or since!

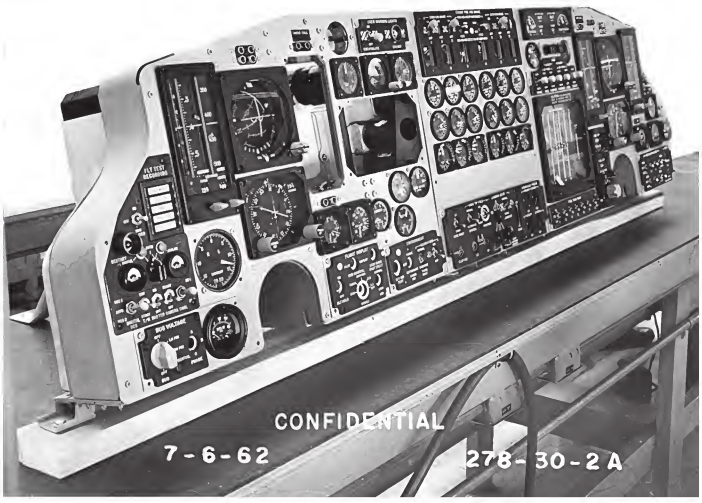
Dear Ed,

I was intrigued by Bob Olesen's article, *"XB-70 – A Legacy of Light"* in the Summer 2014 Issue. I was the design engineer responsible for the structure and arrangement of instruments for the XB-70 Instrument Panel.

I still remember the Chief Test Pilot, Al White, and other flight test pilots congregating around my drafting board and discussing the instruments layout. After they left, I had to redraw the arrangement according to their decision. Because of all the detail required for each instrument, I could not simply erase and redraw the instruments. I had to start over with a fresh sheet of vellum and redraw the entire panel. It took me two to three days to complete each rearrangement. After numerous iterations, I came up with the idea to cut out each instrument and paste it in place like a jigsaw puzzle. I was able to do it in the presence of the pilots and save considerable time. With this "cut and paste" concept, I had beaten Microsoft by at least fifteen years!

— Max Honigsberg, Thousand Oaks, CA

Ed's Ans.: When I look back, I am always fascinated by how much was accomplished with a slide rule, a tee square, a sharpened 4H pencil and a copy of O'Roark or Timoshenko Plates and Shells!



Congratulations and Best Wishes to

David and Eileen Herold of San Marcos, California
celebrating their 67th Wedding Anniversary

Joe and Maureen Collins of Anaheim, California
celebrating their 60th Wedding Anniversary

Stephen and Barbara Hurst of Fullerton, California
celebrating their 60th Wedding Anniversary

Roger and Joyce Lawrence of Dolores, Colorado
celebrating their 50th Wedding Anniversary

The Silent Majority

by Stan Guzy



HARTSFIELD, HENRY W. "HANK", 80 – USAF Fighter and Test Pilot, NASA Astronaut. Hank Hartsfield passed away on July 17, 2014 in Houston, Texas from complications following back surgery. Receiving a B.S. in Physics from Auburn University, he earned an Air Force commission through the ROTC Program and served with 53rd Tactical Fighter Squadron in Bitburg, Germany. Completing training at the USAF Test Pilot School at Edwards Air Force Base, he was assigned to the USAF Manned Orbiting Laboratory Program as an astronaut. With cancellation of the MOL program, he earned a M.S. degree in Engineering Sciences from the University of Tennessee and joined NASA as an astronaut. He was the pilot of *Columbia* on STS-4; the commander on the maiden flight of *Discovery* on STS-41-D; and commander aboard *Challenger* STS-61-A, a 12-man mission which carried Spacelab D-1 into orbit. After completing several administrative assignments, Hank retired and joined the Raytheon Corporation in Houston, Texas. He received several medals and awards including the Gen. Thomas D. White Space Trophy. Hank was a member of the U.S. Astronaut Hall of Fame. He is survived by his loving wife Judy Frances.



NAGLE, STEVEN R., 67 – NASA Astronaut, USAF Fighter and Test Pilot, and aerospace engineer. Steven Nagle passed away in Columbia, Missouri of melanoma on August 21, 2014. He graduated from the University of Illinois with a Bachelor of Science degree in Aeronautical and Astronautical Engineering with high honors and received his commission in the U.S. Air Force through the ROTC Program in 1969. He received his Master of Science degree in Mechanical Engineering from California State University, Fresno. He flew the North American F-100 with the 68th Tactical Fighter Squadron at England AFB, Louisiana and served as a T-28 instructor pilot with the Laotian Air Force before attending the USAF Test Pilot School at Edwards AFB. Selected by NASA to be an astronaut, he served on four Space Shuttle missions: as a mission specialist aboard *Discovery* on STS-51-G, as pilot aboard *Challenger* on STS-61-A, as commander aboard *Atlantis* on STS-37, and as commander aboard *Columbia* on STS-55. After his retirement from NASA, he and his wife, fellow astronaut Linda Godwin, continued to teach at the University of Missouri. Along with his wife, he is survived by their two daughters.

BELL, M. W. "JACK" – of Rancho Palos Verdes, CA passed away after a prolonged battle with Parkinson's disease. Joining NAA in 1954, he was assigned to many black programs and Advanced Engineering projects. He was recognized by the NASA and other U.S. agencies for his contributions to the Apollo and Space Shuttle programs. He retired in 1984 with 30 years of service.

BILLICA, BARRETT M., 92 – passed away on June 19, 2014. Graduating from Purdue University and serving in WWII, he joined NAA as a design engineer. He is survived by his wife, Mary.

BROWN, DEAN W., 88 – of Rancho Palos Verdes, CA passed away on November 7, 2013. Dean retired in 1990 from Space Division with 40 years of service, primarily in the Human Factors group. He is survived by his loving wife of 64 years, Maeola.

BUTCHER, DONALD, 78 – of Merritt Island, FL passed away on March 21, 2014. Don joined LAD and left for service in the USAF in 1955, returning in 1961. He served for over 42 years in Manufacturing and Field Service and retired from the Kennedy Space Center Associate Supervisor of National Operations Move Crew. He is survived by his loving wife of 32 years, Jean.

DINIZ, JOSE A. "TONY", 96 – of Tustin, CA passed away on June 6, 2014. Tony served in Schedule Management at Downey for 21 years on the Apollo and Space Shuttle programs before retiring in 1984. He is survived by his wife of 30 years, Carolyn.

EICHENGER, ROBERT J., 91 – joined the angels on August 14, 2014. Graduating from West Point, Class of 1946, Bob joined the Army Air Forces and trained to fly the P-51 Mustang and flew on numerous assignments. He retired from the Air Force Reserve with the rank of Lieutenant Colonel and joined Autonetics as an engineer on the B-70 Navigation System.

HALE, THOMAS S., 91 – passed away on May 20, 2014 at home in Downey, CA. After serving in WWII, he earned a degree from Iowa State College and went on to a rewarding career at NAA. He served on the Apollo and Space Shuttle programs, retiring with 26 years of service in 1977. He is survived by his wife of 70 years, Marjorie.

HAMILTON, ROBERT M. "BOB", 90 – passed away suddenly at his home in Upland, CA on June 6, 2014. Bob earned an Aero Engineering Degree from USC after returning from Italy where he completed 21 missions as a navigator on a B-24 assigned to the 449th Bomb Group, 47th Wing of the 15th Air Force. In a cyclonic career, he served as an aeronautical engineer at Northrop, Lockheed, Boeing, North American and NASA. He had a great passion for the sea and loved to sail with his wife Jean.

HILL, CLARENCE O., 83 – after battling Alzheimer's disease for several years, Clarence died of a heart attack on July 14, 2014 in Fullerton, CA. Having a very distinguished

career in the U.S. Army, he retired in 1974 as a Lieutenant Colonel. He joined the Space Division Government Relations team and served for another 20 years, primarily on the Space Shuttle and the GPS Programs. He is survived by his wife of 53 years, Gloria.

LEMONS, ROBERT L., 85 – of Hemet, CA passed away on April 10, 2014. Bob retired from Space Division in 1987 after 33 years of service.

LONG, BILLY JACK "B.J.", 91 – of Seal Beach, CA passed away on August 22, 2014. B.J. started his career in Aviation as a junior engineer at Monocoupe Aeroplane in 1941. Entering the Naval Aviation Cadet Program during WWII, he was qualified to fly a multitude of naval aircraft when he retired as a Commander with active service during WWII and Korea. He joined Convair in San Diego and served as the test pilot on the YF2Y-1 Sea Dart and the supersonic F-102A Delta Dagger. He came to Space Division in 1957 as Public Relations manager for major space programs. He is survived by his wife, Wini.

McGEE, GERALD W. "JERRY", – of Rossmoor, CA passed away on June 18, 2014. Jerry retired from LAD in 1981 with 40 years of service. Jerry served as a crew chief on B-29s in the South Pacific during WWII.

OTIS, THOMAS R., 85 – succumbed on August 14, 2014. Joining Autonetics as a junior draftsman, he quickly advanced to senior design engineer, specializing in optical instrumentation for guidance systems. He was a key engineer on many military programs, demonstrating unique technical professional skills.

SANCHEZ, JESUS "JESS", 74 – of La Habra, CA, passed away on July 4, 2014. In 1959, at the age of 19, he joined Autonetics in the Photographic Department along with his brother, Salvador. He played on the company baseball team and loved to sing and dance the salsa. He is survived by his wife of 51 years, Irene.

SMIRL, JAMES H. "JIM", 96 – passed away on June 21, 2014 in Pembroke Park, FL. Jim was in Flight Test Engineering at Palmdale on the F-86 and F-100 fighters. He retired from Rocketdyne in 1972 with 23 years of service. He is survived by his loving wife, Annette.

SOLOMONIDES, BYRON C., 89 – of Columbus, OH passed away on July 27, 2014. Byron was "Mr. Escape Systems" at the Columbus Division. He was deeply involved with the design, development and testing of ejection seats and their systems for the T-2 trainer, A-35 and RA-5C attack and reconnaissance and the OV-10 attack production aircraft and the XV-4A, XV-51 and XV-19 research series aircraft. The ejection seats developed by Byron and his team were survivable from zero speed/zero altitude to Mach 2+ as was proven by a survivor during the Vietnam War. He retired from Columbus in 1989 with 38 years of service. Byron is survived by his loving wife of 64 years, Kitsa.

STRELOW, REUBEN E., 94 – died on August 9, 2014 at Laguna Woods, CA. A graduate of the U.S. Naval Academy in 1943, he remained in the Navy. He graduated from the Naval Post Graduate School and served as an electronics engineer until 1962. He came to Space Division and served on the Apollo and Space Shuttle programs.

LOST SHEEP, BULLETIN RETURNED WITH NO FORWARDING ADDRESS

WILLIAM McGOUGAN – PALM DESERT, CA

ALVIN SHAW – TULSA, OK

JOE LANE – WELDON, CA

RONALD WESTBROOK – OJAI, CA

"It suddenly struck me that that tiny pea, pretty and blue, was the Earth. I put up my thumb and shut one eye, and my thumb blotted out the planet Earth. I didn't feel like a giant. I felt very, very small."

— Neil Armstrong

NORTH AMERICAN AVIATION
RETIREES BULLETIN
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North American Aviation Retirees Bulletin
"Where The Best Never Rest"

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Clinton Johnson, DFRC Public Affairs Office, Edwards AFB via William J. Simone

The third F-107A never received a NACA number since it was only loaned, not transferred to NACA. 55-5120 retained the Air Force serial number, but received the yellow band with the NACA (later changed to NASA) logo on the tip of the vertical tail. The U.S. Air Force markings were removed from the inlet, but the star and bars on both the fuselage and wings were retained.

NORTH AMERICAN AVIATION
Retirees Bulletin
"Where The Best Never Rest"

Winter 2014

Inside:

THE ADVANCED APOLLO PROJECT by Erwin Ulbrich, Jr.
THE CHECKERTAIL MUSTANGS IN ITALY by Jay Stout
THE NORTH AMERICAN XB-28 DRAGON by John Fredrickson



"Bringing the Peacemaker Home" *by Robert Taylor @ The Military Gallery, Ojai, CA*

On 20 July 1944, the 91st Bomb Group attacked an airfield near Leipzig suspected of harboring the new menace – the Luftwaffe's Messerschmitt Me 262 jet fighter. As part of the 401st Bomb Squadron, **"The Peacemaker"** ***was assigned to the lowest position in the formation. As the crew prepared to sight on the target, the plane was struck in the wing and tail. The bucking B-17 began to slip behind the rest of the formation. She was a long way from home. Artist Robert Taylor's dramatic portrayal captures the crippled airplane as it limps toward the sanctuary of the English coast. That she got this far was a miracle, due in no small part to the escorting P-51 Mustangs of the 361st Fighter Group.*** **"The Peacemaker"** ***made it back to RAF Bassingbourne that day – eight others did not.***

NORTH AMERICAN AVIATION
Retirees Bulletin

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Dear NAA Retirees Bulletin Subscriber

Unfurl the Colors! Give us a drum roll! Bugler, sound the Charge! We are going for the fourth and final NAA Memorial Bench at the U.S. Air Force Academy!

The Academy has granite Memorial Benches on the campus grounds but none in remembrance of a private company. We, however, are requesting the bench as retirees of a company that has disappeared 50 years ago and have nothing to sell except our love of Country and our pride in the Company. Since the Academy is training future airmen and airwomen, we added the following words to reflect this:

*** PROVIDING THE WEAPONS TO MATCH THE COURAGE ***

As has become our Winter Issue custom, we again asked a famous Aviation Artist for permission to print his painting of a P-51 Mustang in action. This year it is English Aviation Artist Robert Taylor. In the process, we discovered that his son, Richard, is also an Aviation Artist and that he also has several P-51 paintings in his portfolio! We asked their representative, Rick Taylor (no relation) of the Aces High Aviation Gallery in Ojai, if we could have father and son represented on our covers for this issue and he concurred, adding a short article about the two. If you happen to be anywhere near Ojai, why not drop in and visit the gallery. A print might be too big but both artists have some very handsome art books filled with their fantastic paintings of various aircraft in action!

Author Jay Stout helped us out with the article about the Blue-Nosed Bastards of Bodney. We invited him to favor us with one of his own articles. He provided us with a terrific story from his latest book about a P-51 Squadron stationed in Italy. From the comments we receive, it is obvious that you, our readers, enjoy these action stories involving NAA aircraft as much as we do!

In the Winter 2005 Issue of the Bulletin we did an article about the two *Dragons*, the XB-21 and the XB-28. John Fredrickson, a Boeing Retiree, is assisting Boeing Historian Mike Lombardi as a Volunteer Aide in sorting out all the NAA historical photos and documents that Mike inherited when NAA joined Boeing. From them, he researched the XB-28 and created an article that presents a different view of the airplane. We are pleased to include his article in this issue and we hope to see more of his research in the future.

Although I was assigned to the Apollo program, I never heard of the possibility that Grumman was a year late with the Lunar Excursion Module (LEM or LM) for descent to the surface of the moon and that it may get cancelled. So it came as a total surprise when Erwin Ulbrich came up with a study conducted by the Apollo Project Engineering Department headed up by M.W. "Jack" Bell to land a "tanker" vehicle on the moon surface and then land a modified combined CM/SM nearby, refuel the manned vehicle, complete the study of the Moon surface and then return to Earth.

With this issue, another year comes to an end and it is time to renew subscriptions. Check the date above your name on the address label. **IF IT SAYS DECEMBER 2014, THIS IS YOUR FINAL ISSUE AND YOU MUST RENEW!** You don't have to cut out the coupon or mess up this copy of the Bulletin. Just write out a check to **BALD EAGLES, INC.** and send it to:

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At the same time, our thoughts turn to you, our subscribers and, we hope, our good friends. It is a painful time for us because it reminds us of the many that are no longer with us. We remember all of them in our prayers and we wish that all of you share in God's Blessings of peace, good health and long life. *AMEN! SHALOM ALEICHEM!*

Our Volunteer Staff Members, Sonnie Robertson and Nolan Leatherman, are going through major medical issues! Please remember them in your prayers. Prayers from the heart are never wasted!

The Advanced Apollo Project

by Erwin A. Ulbrich, Jr.

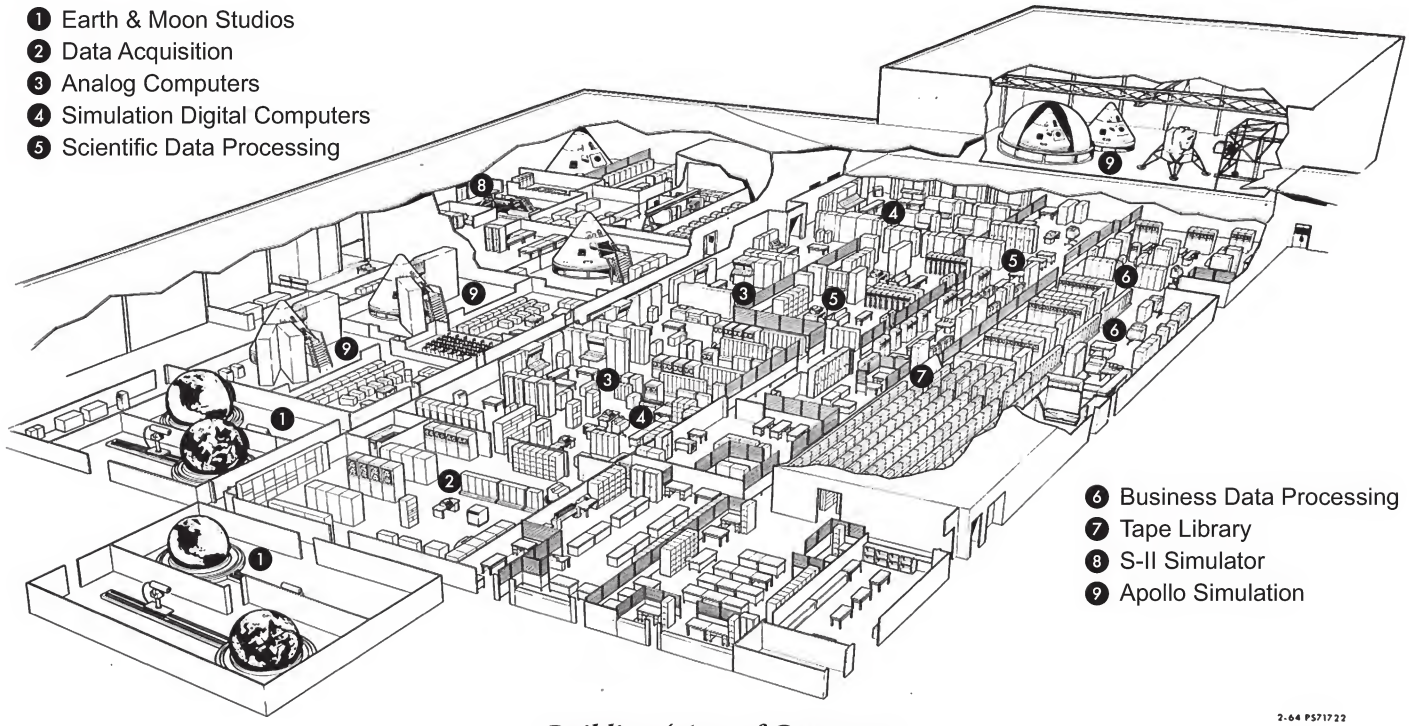
Late in 1964, the Apollo Program was in full production with various designated Command Modules (CM) and Service Modules (SM) in various stages of completion. There was some worry over the large number of authorized Change Orders outstanding on every assembly, but a greater concern was that the Lunar Excursion Module (LEM and later LM) was a year late. The Apollo Project Engineering Department headed up by M.W. "Jack" Bell decided to investigate a possible back-up program using NAA funding. The basic question that arose was how to perform the lunar mission if the LEM was cancelled! The basic solution conceived was to send a Refueling Module up to the Moon and land it using an automatic landing system. Then, a modified CM/SM manned vehicle would be designed to land on the Moon next to the Refueling Module. The Project Office initiated the action to build a simulation of such an arrangement to prove feasibility and demonstrate the concept. The landing of the manned vehicle would have to be close enough to allow some sort of cryogenic hoses for both rocket fuel and oxidizers to be transferred from the Refueling Module for the return to Earth. The multiple steps of LEM extraction, crew transfer, landing and return to orbit, docking, discarding the used LEM, etc. would be avoided. It was decided to do this simulation in Building 4 in Downey using existing simulation hardware existing in the Computing and Simulation Center.

There were analog, digital, and digital differential analyzers available as well as a variety of prototype modules, Earth and Moon models, flight control simulation hardware, televisions research facilities, etc. There were two integrated simulation groups, one for Apollo and one for Advanced Design. The latter was given the Advanced Apollo task, but the module to be modified for use came from the former. The personnel were housed in one big bullpen, and a standing joke was, *"When will Building 4 be brought up to Building 5 standards?"* where the Head Shed was located. There was a large annex behind the building (seen below with capsules in it) where the simulator would be located along with the television studio and using computers located in the air-conditioned area. The liaison engineer between the Project Office and the Advanced Simulation Group was Roger Oglevie who has supplied the pictures for this article.

The final configuration used a Modified Command Module. It was built in an Apollo capsule with a large vertical window and an appropriate pilot seat and controls. The out-the-window view showed the lunar surface and a star field when looking towards the horizon. In the foreground was a refueling rocket assumed to be landed automatically on the Moon after a flight from Earth. The overall objective was to find the refueling rocket and land right alongside of it in a Command/Service Module which has been modified for landing, refueling, and takeoff. The landing engine was assumed to work across a range of thrusts.

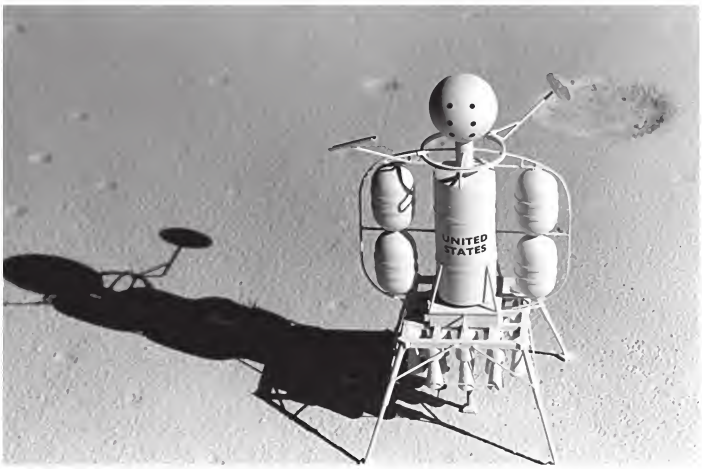


Overview of a Modified Apollo Command Module Landing on the Moon



Building 4 Acre of Computers

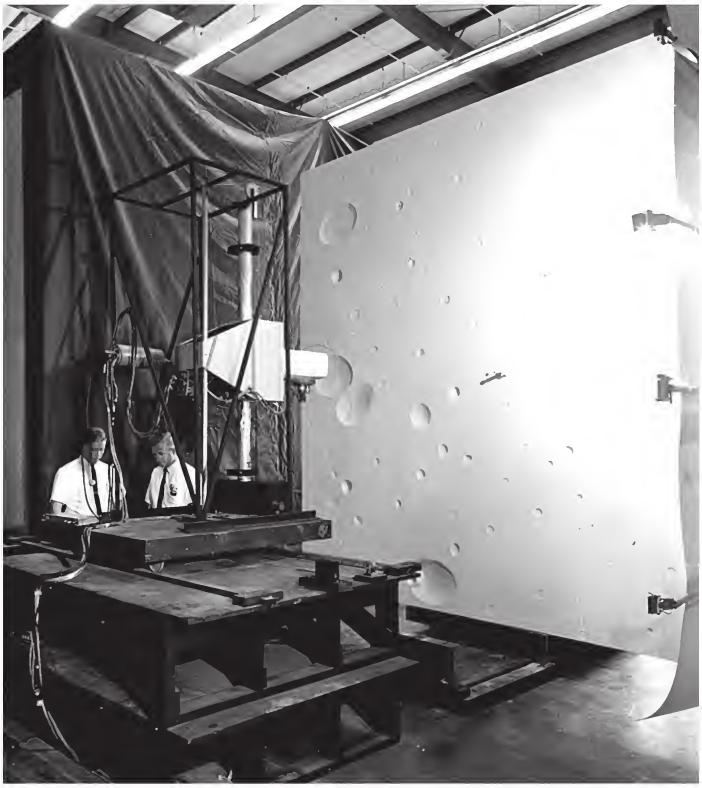
There was not enough time for an extensive design of a Refueling Module, so I asked one of the engineers to dream up a scale model overnight. The next morning, he brought in the model pictured below. Everybody liked it so that was what was used. The multiple rocket engines are made from cut off pencil points and the pressurization helium tanks on the sides are made of NE-51 plastic neon light covers. The engine design looked surprisingly like the Falcon 9 in current use by SpaceX.



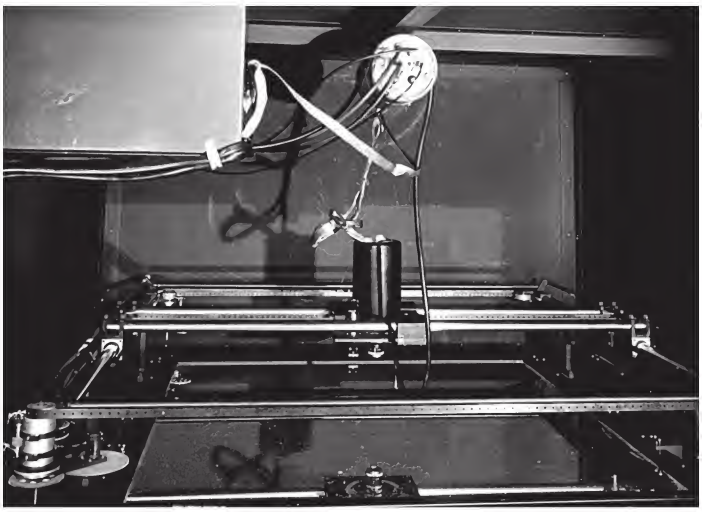
Scale Model of the Refueling Vehicle Already Landed on the Moon

The surface of the Moon had been carved from Styrofoam and painted. The illumination was from floodlights. The star field is not shown in this view.

The star field generator produced random stars that could move in two dimensions and gave some amount of visual cues during the landing. The six-degree of freedom camera transport and the lunar terrain provided the rest of the visual cues.

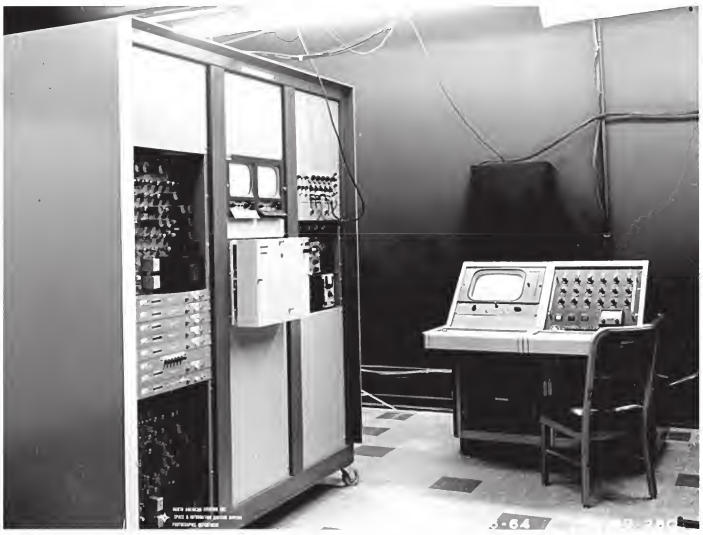


The Six Degree of Freedom Camera Transport



The Star Field Generator

The simulator also had aural simulation with a speaker under the capsule generating engine noise that was proportional to thrust. There was a remote Control Studio for the simulation with the six degree of freedom transport controls on the right and the video controls on the left. The little CRTs showed the raw star field and the raw terrain. The larger CRT showed the composite picture.



The Control Studio

Trajectory calculations were computed in analog computers in the main computer area. M.W. "Jack" Bell, the Chief Project Engineer, flew the simulator in February 1965 and proved to himself that the existing Apollo equipment with appropriate modifications could land three people on the Moon and, theoretically, could be refueled on the Moon from a previously positioned tanker and then return to Earth.

At the conclusion of this simulation, a general reorganization of the Space Division began and much of the Information Systems Subdivision where this work was done was eliminated. Most of the engineers, including myself, who had performed so brilliantly were subject to a reduction in manpower and were gone by Summer 1965. The original LEMs were eventually delivered and were successfully employed in six actual landings on the Moon in the late 1960s.



M. W. "Jack" Bell Flying the Simulator

As a footnote to history: Downey, at the time, maintained an NAA TV studio which had a kinescope for recording video. We sent our simulation videos to that studio by reversing the line amplifiers that they had and started making video recordings on second shift of our landings without official management permission. When this was discovered, all the films were destroyed or else, you could have seen our actual results on your cell phone or computer today.

About the Author: Erwin brings a gold mine of Aerospace experience to our Bulletin, ranging from the Manhattan Project to Avionics Integration on the B-2A Stealth Bomber. At NAA Columbus, he served on the T-2, A3J and the Roadrunner. At NAA Downey, he worked on the Apollo, S-II and Advanced Apollo Programs. He also has dedicated 30 years to teaching at UCLA. We hope that he shall favor us with more articles in the future. Erwin currently resides in Whittier, California with his charming wife, Myrna.

"We need men who can dream of things that never were."

— John F. Kennedy

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The Checkertail Mustangs in Italy

by Jay A. Stout

This material is excerpted from Lieutenant Colonel Jay A. Stout's book, "The Men Who Killed The Luftwaffe". *It is used with Stout's permission as well as that of the publisher, Stackpole Books.*

The legendary P-51Mustang is most often remembered as an icon of the England-based Eighth Air Force. Such thinking is natural as the Eighth operated more Mustangs than any other air force. That fact notwithstanding, the Eighth's Italy-based counterpart, the Fifteenth Air Force, also flew the P-51 to great effect. One of the Fifteenth's most successful fighter groups was the 325th—the Checkertail Clan—which was based at Lesina, near the heel of the Italian boot in 1944.

Among the 325th's many successful flyers was Art Fiedler. From Oak Park, Illinois, he arrived in the spring of 1944 and was assigned to the P-51 immediately. His experiences-recounted below-are representative of how the Fifteenth used the Mustang in combat.

Destroying an opponent in a dogfight required a fighter pilot to fly his aircraft to a position where-upon firing his guns—his bullets and the enemy arrived at the exact same point at the exact same instant. Doing so was extraordinarily demanding. Although many pilots possessed the innate physical and mental attributes required to become an expert, it was not a talent that many of them were born to. Rather, it demanded training, practice, and a certain degree of patience and composure.

"Herky Green, our previous group commander, had been bumped up to higher headquarters," remembered Arthur Fiedler of the 325th Fighter Group based out of Lesina, Italy. *"And my plane was getting an engine change so I was assigned to fly his. His crew chief, Sergeant Brown, was really particular about that plane. He got right into my face when I was strapping in. 'Lieutenant,' he warned, 'best you bring this bird back in one piece!'*

"That day, September 6, 1944, was the only day I flew a mission to Greece," Fiedler remembered. *"Our squadron put up sixteen aircraft to escort a force of B-24s against the airdrome at Kalamaki, just south of Athens. I was leading a flight of four on the right rear side of the squadron box formation we were flying. My wingman was in position on my left side and the other two-ship element was flying to my right. The commanding officer led the flight of four directly in front of me and the other two flights of four made up the left side of the box."*



Fiedler Collection via Stackpole and Stout

Art Fiedler stands in front of the P-51 he named after his wife, Helen.

The mission had been uneventful; the weather developed to be better than expected and the rendezvous with the bombers went without incident. In fact, expectations were that the entire mission would be fairly routine. The Luftwaffe had been scarce in southern Europe since Ploesti had fallen the previous month, and Athens wasn't surrounded with the same sorts of flak defenses as tougher targets like Munich or Vienna. The bombers were flying at only about 14,000 feet. *"They did this,"* Fiedler recalled, *"whenever they didn't expect a lot of flak or fighters. It was much more comfortable for them to fly at lower altitudes where it wasn't so cold and where the bombers performed better."*

The east-bound raid reached a point about fifteen miles west of Athens when Fiedler got his first indication of impending action, *"In front of me I saw the tail of the CO's aircraft wagging back and forth as if his wing tanks were stuck and he was trying to shake them off. And then, as I looked through him, in the distance, I could see a pair of Ju 52s very low over the water."* The Ju 52 was a lumbering, fixed landing gear, three-engine transport that dated from the early 1930s. Nicknamed *"Tante Ju"* (Aunt Ju) by its crews, it was sturdy and easy to fly and maintain, yet hopelessly outclassed by later machines. That fact notwithstanding, it remained the backbone of the Luftwaffe's transport force.

The Ju 52s approached the east-west runway at Megara from the east over the Aegean. The base had been active for most of the war and had been variously used by the Greeks, the British, the Italians and now the Germans. Under Axis control since 1941 when the British had been ejected from Greece, the dusty airfield was an occasional target for Allied bombers.

Fiedler didn't care about any of that. *"I was excited. German aircraft were getting hard to find at that point in the war."* Without waiting for any signal or command, Fiedler reflexively released the two 75-gallon fuel tanks that hung from his wings, pushed the nose of his fighter down and pointed toward the two transports. *"I was quite pleased with myself—I was going to beat the entire squadron to those two enemy planes."*

Accelerating fast in his steep dive, Fiedler was sure that the two Ju 52s belonged to him. *"I thought that I was so smart; I believed that I'd gotten the drop on everyone else. But it didn't turn out that way at all."* He took an instant to throw a quick look up at the squadron mates he had just left behind. *"There were three other holes in the formation where the other flight leaders had pulled the same trick. I was competing with three other guys—we were all gunning for the same aircraft!"*

Fiedler's airspeed in a 70-degree dive quickly increased past 400 mph. His heading was leading toward a head-on pass with the two transports. *"I realized that there was no way that I was going to be able to come out of my dive and set up in time to make a good head-on pass against those guys. But at the same time I wanted to make sure I beat the other flight leads to the punch."*

The P-51 flattened out of its dive as Fiedler hauled back on the control stick and banked left so that he could create enough turning room to make a right-hand turn behind the second of the two silvery Ju 52s. It was trailing the first by about 250 yards. *"I stayed as fast as I could for as long as I could,"* Fiedler recalled, *"then reversed my turn to the right, chopped the power and slowed to 410 knots and dropped ten degrees of flaps."* The flaps added lift to Fiedler's wing and allowed him to tighten his turn. The 'g' forces pushed him down into his seat as he strained to maintain his focus.



Fiedler Collection via Stackpole and Stout

Art Fiedler's P-51D,* "Helen"*, parked at Lesina, Italy, in 1944.

"It worked," Fiedler said. *"I was able to outturn the other guys-they ended up overshooting behind me."* Fiedler finished his turn and rolled back to level flight just above the water and about 150 yards behind the trailing enemy aircraft. *"I opened fire and didn't really see any hits except on the left main landing gear and the left wing root. Then, all of a sudden, the aircraft exploded and nosed straight down."* There likely were no survivors as the Ju 52 hit the beach hard, just at the waterline, and continued to burn.

There was almost no time for Fiedler to set up his attack on the remaining transport which at that point was just touching down on the runway; Fiedler's Mustang closed on it fast. *"I immediately lined up on the other airplane,"* he said. *"It touched down, then bounced high in the air then came back down and bounced again. I fired and hit the runway just behind his port engine. Then I hit his left wing and engine and he exploded."* The transport churned up a huge cloud of dust as it careened off the right side of the runway at a forty-five degree angle. Flashing past, Fiedler saw that it had tipped over on its nose, smoking.

"Then," Fiedler remembered, *"another P-51 flew over the top of me so close that it rocked my airplane—I thought we'd had a mid-air."* He pulled the Mustang hard into a near-vertical climb to get away from the ground and make certain that he had enough altitude in case he needed to bail out. *"But the plane was flying okay and flak was bursting all around me so I stuffed the nose back down and got right back on the deck—and by that I mean about five or ten feet above the ground."*

To the south of Megara there was a ridge and Fiedler slid quickly over to the other side, away from the enemy guns and east toward Athens and Kalamaki. *"In the distance I could see enemy aircraft kicking up dust as they came into Kalamaki. I think they were hurrying to get on the ground and away from us.*

"By the time I got within range," he continued, *"the only aircraft that hadn't pulled into a revetment was a lone Ju 88. He was taxiing so fast that I think he may have crunched the aircraft trying to get parked. Anyway, I climbed up to about fifteen feet, let my nose drop slightly and settled the pipper of my gunsight right on his canopy."* Six streams of lead converged from the .50 caliber machine guns and tore into the German twin-engine bomber. Fiedler noted with satisfaction how the glass nose of the enemy aircraft disintegrated into a sparkling cloud of crystalline powder.

Fiedler recalled: *"I was really moving—and low. I bent the plane hard over in a left-hand turn and saw this guy running across the airfield toward some sort of gun emplacement. He looked up at me and realized that he wasn't going to make it. I continued my turn around and pointed right at him. Then, I saw him pick something off the ground and heave it up at me; whatever it was went tumbling over my left wing missing my prop by only a couple of feet.*

"Well that made me mad!" Fiedler continued. *"So I whipped into a right-hand turn so I could get back around and shoot him. Suddenly, the ground right in front of me erupted in a huge explosion. I felt my right wing lift up and heard a rattle like someone had thrown a bunch of marbles against the plane."*

Fiedler instantly lost interest in his belligerent, rock-hurling friend. Shaken by the explosion and uncertain of what had caused it, perhaps anti-aircraft fire or a bomb from the raid, he raced for the perimeter of the field and safety. *"The aircraft was flying fine,"* he recalled, *"so I ended up joining with some of the other guys and getting back home without any trouble."*

Back at Lesina, Fiedler pitched his aircraft into the landing circuit and did two victory rolls for the brace of Ju 52s he had killed. *"Sergeant Brown,"* he recollected, *"was so excited he could hardly stand it. He told me: 'Lieutenant, you can fly this bird any old time you want!'"*

Whereas the Eighth Air Force's sphere of operations included northern Europe, it couldn't penetrate deep into the east or south. Those areas belonged to the Fifteenth. By the end of August the Italy-based Fifteenth had destroyed the oil complexes in Romania and as Summer turned to Fall it continued to hit targets across a wide arc from west to east and



Fiedler Collection via Stackpole and Stout

A 325th Fighter Group P-51D flies in late-war markings.



Fiedler Collection via Stackpole and Stout

Art Fiedler in the cockpit of a P-51D. Fiedler finished the war with eight confirmed aerial victories.

north into much of Germany. Its operations encompassed Hungary which had, for some time, been a reluctant partner with Germany. The Nazi state relied heavily on raw materials from Hungary, especially oil.

"We were out on a strafing mission just north of Budapest," remembered Art Fiedler of the 325th Fighter Group. *"But we really didn't have any business being up there, the weather was atrocious."* Nevertheless, Fiedler's squadron, the 317th, found a hole in the clouds and snaked down below the lowest of the ragged layers until all four flights of four aircraft each were strung in a long west-bound line along the Danube. Fiedler remembered: *"The group was supposed to look for things to strafe from Budapest to Vienna. Our squadron was assigned the section from Budapest west to Gyor, about seventy miles away."*

The date was October 12, 1944. The Germans were hard-pressed everywhere. Whereas Hungary had been securely under Axis control only a few months earlier, the Russians had recently swept through Romania and were now pressing hard toward Budapest. Aside from German or Hungarian aircraft it was possible that the squadron might encounter Soviet machines.

"The four flights were following each other in trail, about a couple of hundred yards apart, right where the river makes an east-west turn just north of the city," Fiedler said. *"I was leading the third flight and conditions were awful. The clouds were down almost to the ground in places and only went up to about 900 feet at the very best."* With barely a half mile of visibility, the pilots strained into the gloom and looked for anything that might merit getting shot up. *"We were also very wary of running into high tension wires,"* he remembered.

"Then, out of the corner of my eye," recounted Fiedler, *"I caught just a glimpse of something at about 9 o'clock; it was a big airplane."* The mystery aircraft quickly disappeared behind a shroud of ragged clouds and Fiedler found himself wondering at what he saw. *"At first I thought that it was a B-17, but that didn't make any sense as there was no reason for a B-17 to have been down there that low with us."*

Fiedler gently lifted the nose of his aircraft, dipped the left wing and slipped over the top of the two-ship element on his left wing. *"I really didn't want to alert the entire squadron,"* he said. *"If it turned out to be anything, I wanted it to myself."* For several seconds it seemed that Fiedler's disappearing act would succeed. *"But my wingman called and asked where I was going. I just kind of shrugged him off and told him that I thought I might have seen something."*

It turned out that he had indeed seen something. *"I caught sight of it again,"* Fiedler said. *"It was an He 111!"* Still, he was cautious. *"We had been told that the Russians operated a twin-engine bomber that looked something like an He 111, so I didn't want to start shooting it up right away. I had to make certain that it was an enemy aircraft."*

As Fiedler closed the distance to the other aircraft he noted its unusual camouflage. *"It wasn't like anything I'd ever seen. The aircraft was silver but it was painted with black wavy lines, like sine curves. They were stacked on top of each other and ran across the fuselage at an angle. It was the strangest paint scheme I'd ever seen."*

He was confused about the nature of the other aircraft. *"I was certain it was an He 111, it had that distinctive notch cut out of the bottom of its rudder. But it didn't have any markings. Nothing. I kept getting closer, and closer; I figured I'd see if I could get close enough to see if it had any writing on it at all, Cyrillic or German."*

Fiedler finally closed into a parade formation just off the right rear of the aircraft and low. *"If I'd pulled my nose up just a little bit I would have cut his right horizontal stabilizer off."* Still, there was nothing on the aircraft that marked its nationality. *"And then,"* Fiedler remembered, *"the gunner in the top turret spun around, lowered his guns and started shooting at me!"*

Fiedler had already started to bring his guns to bear as soon as the turret started moving. The sharp sound of bullets striking his aircraft only increased his agitation. Markings or not, he now had a pretty good indication the other aircraft was not friendly. Fiedler returned fire with his P-51's six .50-caliber guns. *"The turret just disappeared from the rounds I put into it. Then I shot away his cockpit and his left engine before putting more bullets into the fuselage and right engine. He nosed over and went right down into the ground."*

Fiedler completed his overseas tour as an ace. He was credited with eight aerial victories. He separated from the Army after the war and earned an engineering degree at the University of Illinois. However, he was subsequently recalled to active duty during the Korean War. He ultimately decided to make a career in the newly-created United States Air Force and retired as a colonel in 1975 having flown 237 missions during the Vietnam War. Among his many military decorations is the Silver Star.

About the Author: Jay A. Stout is a retired Marine Corps fighter pilot who flew 37 missions during Operation DESERT STORM. An award-winning writer, Smithsonian Air & Space lauded Stout's recent release, Fighter Group—The 352nd Blue-Nosed Bastards in World War II*: "This may be the finest book yet written about the air war over Europe during World War II." Stout's tenth book,* Hell's Angels—The True Story of the 303rd Bomb Group in World War II, *will be published in January 2015. He lives with his wife in San Diego, California.*

The North American XB-28 Dragon

by John Fredrickson

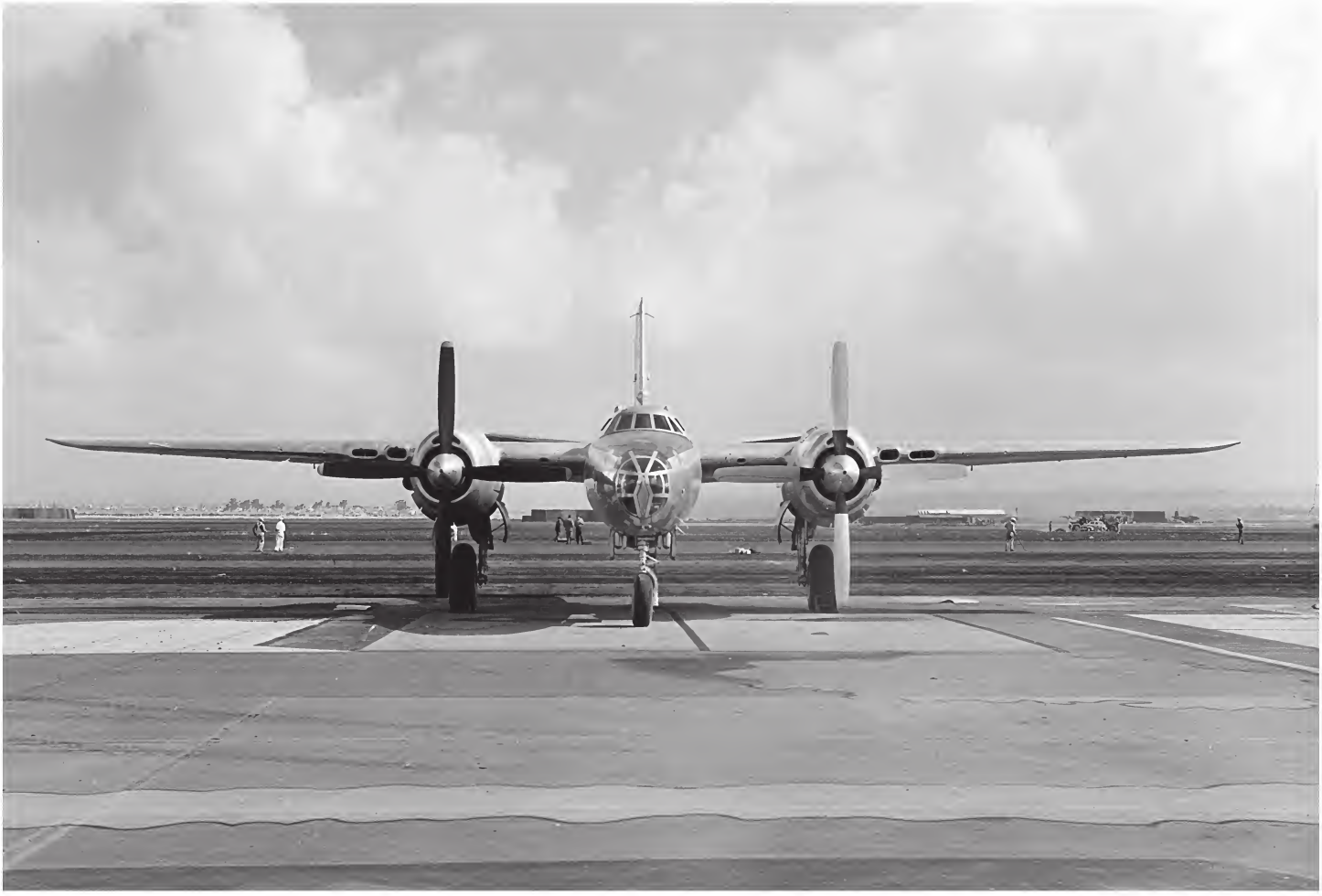
A contract for the design of next generation of medium bombers was awarded to North American Aviation, Inc. in 1940. The initial goal was to update the B-25 Mitchell medium bomber, then itself barely on the cusp of entering military service, with a variant boasting more powerful engines and a crew compartment pressurized for operations at higher altitudes. As frequently happens, the design evolved into a totally new aircraft that first took flight on April 26, 1942. The XB-28 was of similar size and configuration as the Mitchell but had a single, rather than dual tail. More powerful engines, a pair of 2,000 horsepower Pratt & Whitney R-2800 engines, made it faster while pressurization contributed to aircrew safety and comfort at the higher altitudes where it was designed to operate.

Like the earlier XB-21, a B-25 precursor, the XB-28 was also named "Dragon". The name *Dragon* did not bode well for either design because neither project made it beyond the demonstration phase. The Douglas B-18 Bolo was upgraded and re-designated B-23 and the name Dragon was also applied to it. Both airplanes were variants of the very successful Douglas DC-2/DC-3 airliners. However, as warplanes, they were duds. Few were built and no example of either model saw any overseas combat duty.

Another forgotten page in the annals of aviation history was the Vultee A-31 and successor A-35 Vengeance. The Vultees continued in production at the Nashville plant until almost 2,000 were assembled for no good reason other than to keep the plant open and work-force busy pending the never-consummated arrival of a better design. Their only utility for the U.S. Army Air Corps was pulling target sleeves. Policy makers during the war debated the merits of striving for smaller numbers of leading-edge airplanes versus meeting numerical production goals. They finally recognized that unwanted obsolete designs were a waste of precious labor and scarce materials.

The expected benefit of bombing from higher altitudes was a measure of safety from ground based anti-aircraft artillery (sometimes called Triple "A" or AAA) and from fighters incapable of attaining like altitudes. However, high altitude bombing was problematic before the invention of modern "smart" bombs. The concept of a smart bomb was not to appear until much later – not until the waning days of the Vietnam War.

Military aviators were briefed on the Law of Armed Conflict (sometimes called the Law of War) which is a branch of international law which seeks to limit harm to non-combatants.



The Boeing Company archives via Michael Lombardi

The circular pressurized fuselage of the XB-28 appears small when compared to the nacelles of the 2,000-hp Pratt & Whitney R-2800 engines.



The Boeing Company archives via Michael Lombardi

The XB-28 undergoes engine run-up tests of the Pratt & Whitney R-2800 engines.

In simplified terms, attack against any military related asset is condoned while innocent civilian targets should generally to be spared.

The measure of traditional bombing accuracy is expressed as CEP (or circular error of probability). The ability to reliably take out small targets like bridges, dams, radio transmitters, or electrical sub stations was especially vexing. It was said the famed Norden bombsight could "drop a bomb in a barrel from 18,000 feet" and this assertion may have had a placebo effect on any aircrew members harboring qualms of innocent civilian deaths caused by bombing errors.

The fallacy of protecting innocent civilians from collateral damage faded towards the end of the German campaign. The façade had totally vanished by the time of the horrible fire bombings which incinerated tens of thousands of Japanese urbanites in Tokyo and other cities near the end of the war. After the horrible battles at Okinawa and the other Pacific islands, it was assumed all Japanese were potential combatants when defending their homeland.

The phrase *"High altitude precision aerial bombardment"* was oxymoronic. While the Norden bombsight was an invaluable aiming tool, the combination of high altitude, clouds, human error, and winds aloft too frequently combined to yield unfavorable CEPs. The average CEP in 1943 was 1,200 feet. The measure of bombing success was called Bomb Damage Assessment (or BDA). BDA was most often determined by aerial photographs and most bombers carried some form of downward looking camera which will record the pattern of craters which pockmark the target area.

The method to make target destruction from high altitudes more effective was either more ordnance (e.g., bigger formations of bombers), or bombs sized to be bigger, heavier, and more destructive. Small bombs weighed 100 pounds, the 500 or 750 pounders were more common, and some blockbusters tipped the scale at 1,000 pounds or more. The atomic bomb was the ultimate expression of this concept. Additional explosive yielded a broader kill radius in the quest to ensure target destruction in spite of CEP.

The payload of a medium bomber was, by definition, limited – but the aircraft performed the mission more effectively at lower altitudes. The XB-28 Dragon project was terminated because military strategy had evolved. There was no longer sufficient need for a pressurized high altitude medium bomber. External decisions impacting North American were never in a vacuum and always in the context of "lessons learned" tempered by ongoing national and global events. In any case, most of the assembly line workers at the Los Angeles Division, while fully immersed in war-bird construction, did not burden themselves with the theoretical details of aerial bombardment.

However, General Arnold commented that the XB-28 was an important precursor to the eagerly awaited pressurized Boeing B-29 long range heavy bomber then in development. Arnold described the XB-28 as a miniature B-29 while stating: *"Some experimental planes are never mass produced, although we learn valuable things from them."* More money would be expended on the B-29 project than on any other World War II weapon system.

North American received a contract to build a second XB-28, designated the XB-28A, for evaluation as a reconnaissance aircraft because the Army was impressed with the performance of the first XB-28. Experimentation ended when the second prototype crashed into the Pacific Ocean off the California coast on August 4, 1943. Fortunately, the two civilian crew members, Bob Chilton and Roy Ferren parachuted to safety. As Ferren dropped from the aft hatch and passed under the aircraft he noticed that the vertical tail was bent about 45 degrees to the left.

The XB-28 was an example of a number of designs conceived, tested, and evaluated but abandoned during the war.

The government wisely limited the proliferation of new airplane designs to allow manufacturers to focus on high rate production of a limited array of airplanes – many of which were deemed to be "good enough." Full-throttle spending and research was continued on other weapon systems – to include the Boeing B-29 bomber and early jet powered designs, e.g., P-80 from Lockheed. Funding was funneled only to those projects which were considered to be strategically needed for achieving Allied victory.

About the Author: John Fredrickson retired as a senior manager at the Boeing Company in 2011 after 36 years of service. He has 21 years of combined active duty and reserve service with the U.S. Air Force and is a Vietnam War veteran. He has published "Kansas City B-25 Factory" *from Arcadia Press and is currently preparing a second book* "Warbird Factory: North American Aviation at Inglewood during World War II" *from Zenith Press. John resides in Kent, Washington with his charming wife Ikoyo.*



The Boeing Company archives via Michael Lombardi

The 72-foot wingspan of the XB-28 takes up most of the width of the factory floor.

TECHNICAL NOTES: XB-28 Dragon

Armament:	Six .50-cal. machine guns (two in each of three remote-controlled, power-operated turrets and four thousand pounds of bombs
Engines:	Two Pratt & Whitney R-2800-27 Double Wasp radials of 2,000 hp each (takeoff power)
Maximum speed:	372 mph
Cruising speed:	255 mph
Range:	2,040 miles
Service ceiling:	33,500 ft.
Span:	72 ft. 7 in.
Length:	56 ft. 5 in.
Height:	14 ft. 0 in.
Weight:	35,740 lbs. (gross)
Crew:	Five
Serial numbers:	40-3056 (XB-28) and 40-3058 (XB-28A)



The Boeing Company archives via Michael Lombardi

Failure of the tall vertical fin during flight test caused loss of the XB-28.



The Boeing Company archives via Michael Lombardi

The XB-28, painted olive drab and gray awaits flight testing at Wright Field, Ohio.

A Family of High Fliers

by Rick Taylor, The Military Gallery

In the world of aviation art, the name "Taylor" holds a special place. There is no disputing that Robert Taylor is regarded as the world's finest aviation and maritime painter – a well deserved international reputation established over four decades.

During that time, he has created some of the most iconic air combat paintings ever seen, many of which have been exhibited in the world's most prestigious venues – his year-long, one man show at the Smithsonian's National Air & Space Museum in Washington, D.C. is still regarded as one of the most successful events of its kind ever held. In addition, to this are his countless admirers who, over the years, have included such legendary aviators as Generals Jimmy Doolittle and Curtis Le May, Group Captain Sir Douglas Bader and General Adolf Galland. To say nothing of President George Bush Senior, Hollywood actors and directors and even the British Royal family!

With such a talent in the Taylor household it would have been understandable if all of his five children had run a mile from anything to do with the world of professional aviation art. But one of them, Robert's youngest child, Richard, was enthralled. The unmistakable aroma of oil paint and turpentine wafting from his father's studio was as ingrained in Richard's boyhood as the comforting aroma of his mother's home baking.

And when the talk turned to painting, print publishing or the great aviators who had fought in World War II, many of whom were personal family friends, young Richard was listening to it all. But if the talk around the house or the paintings in his father's impressive studio weren't enough to inspire the imagination, then the huge library of research material and vast array of stunning model aeroplanes certainly was! And Robert was only too happy to encourage his son's keen interest, patiently teaching him the "arts" of oil painting to reveal a natural artistic flair.

As Robert remarked, *"it must be in the genes!"* Over the last eight years Richard has set the world of air combat and military art alight and is regarded as one of the most exciting and accomplished aviation artists of his generation.

Robert Taylor has had nearly a dozen beautifully illustrated books of his paintings published during his lifetime. They have been reprinted many times, a feat unparalleled by any other aviation artist. So it is with great pride that this year Robert can witness the release of Richard's very first book, devoted solely to his aviation and military art. The colour images in it have been successfully published as limited edition prints by the Military Gallery – the same publishing house that has represented his father Robert for forty years. Now with Richard carving out such an exciting niche for himself, the Taylor name looks set to dominate the world of aviation art for many years to come.

Richard Taylor's new book "The Art of Combat" *is available from Aces High Aviation Gallery, Ojai, California – (800) 528-0887.*



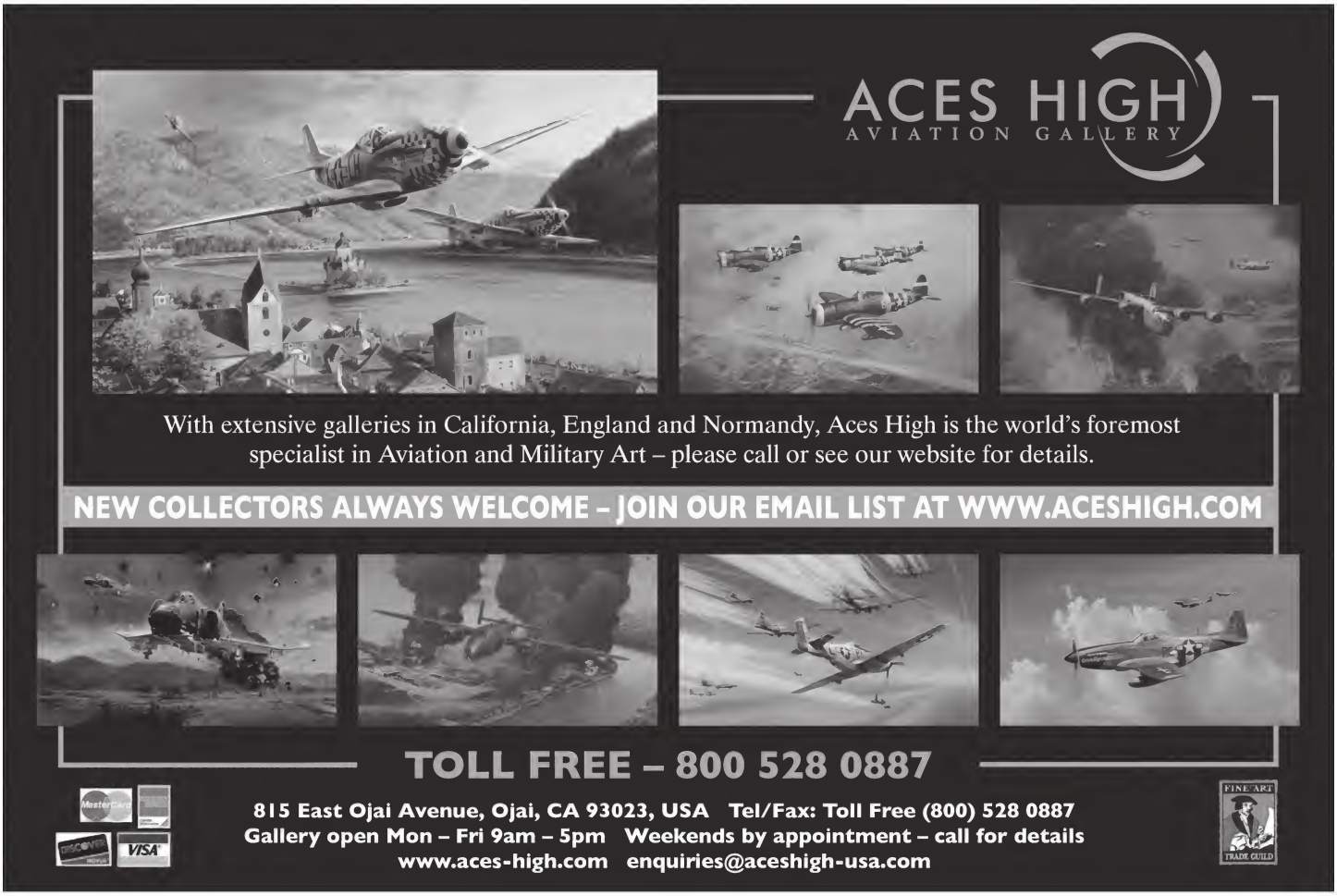
Courtesy of Rick Taylor, The Military Gallery

Father and son aviation artists, Robert and Richard Taylor, review the smallest details to assure the accuracy of the aircraft being portrayed in their paintings.



Courtesy of Rick Taylor, The Military Gallery

"Mustangs on the Prowl" ***by Robert Taylor***



Accounting for NAA Memorial Benches

by Ed Rusinek

Total Funds Remaining for Proposed Bench at the U.S. Air Force Academy.....$3,562.05

List of New Donors for NAA Memorial Bench at KSC

Name	City	Division Affiliation	Rememberance
Richard L. Robbins	Fayette City, PA	Space, JSC	In Memory of My Friends at Space, Columbus and JSC, especially Al Morton and Tony Parkas

Total Funds Available $3,662.05

The P-51 Mustang War Diary

January 11, 1944—Mustangs were revealed for the first time by the Army Air Force as being in use as long-range fighter escorts for heavy bombers; although, the P-51Bs had been used as "top cover" for the bombers since December 2, 1943. The Mustangs flew with the heavies, estimated at close to 1,000 on a raid that virtually obliterated three German fighter plane assembly plants on the outskirts of Berlin. During the attacks on Oserschleben, Halberstadt and Brunswick, Mustang pilots shot down 15 enemy planes and damaged many more of the estimated 100 Nazi fighters that attempted to intercept the bomber formations.

The Mustangs, led by Major James Howard, made the deepest penetration into Germany of any Allied fighters, flying more than 400 miles into the heart of the Reich. En route home, Major Howard distinguished himself by single-handedly protecting an entire combat wing of bombers from attacks by 30 Nazi planes. Separated from his unit, Major Howard dived and climbed and twisted his Mustang through vertical miles of sky, firing at members of the Luftwaffe trying to reach the bombers.

When all of his guns but one had ceased firing, he bluffed the German pilots into breaking off their attacks, continuing his lone "flying circus" for a half hour precious time for the bombers. During his 30-to-one battle, before he dove out of sight on the tail of a Nazi, Major Howard claimed two enemy planes destroyed, two probably downed and one damaged.

Excerpted from "The P-51 Mustang War Diary" *published by NAA in 1944*

Editor's Update: James Howard received his Wings of Gold in 1939 and was assigned to the aircraft carrier USS Enterprise *(CV-6). He left the Navy in June 1941 to join the American Volunteer Group, better known as the* "Flying Tigers." *Credited with six "kills" during the 56 missions he flew, he returned to the United States in July 1942 when that group was disbanded. Commissioned a Captain in the U.S. Army Air Forces, he trained on the P-51 Mustang. Promoted to Major in 1943, he was given command of the 356th Fighter Squadron of the 354th Fighter Group escorting heavy bombers from Britain.*

On January 11, 1944, the lead attack formation was the 401st Bombardment Group (Heavy) facing some of the most intense opposition from enemy flak and fighters. Poor weather had separated the bombers from their fighter escorts and the Luftwaffe was feasting on the vulnerable bombers. Then, through the clouds, one lone P-51 appeared and relentlessly attacked the German aircraft for over half an hour until he had exhausted his ammunition. Despite 30-to-1 odds, he managed to shoot down six enemy planes and beat off the others. That day, the 401st was led by Major Allison Brooks, who remarked about the lone Mustang pilot, "It looked like one American against the entire Luftwaffe. He was over us, across the formation and around it. For sheer determination and guts it was the greatest exhibition I had ever seen." *For his action that morning, Colonel James Howard was awarded the Congressional Medal of Honor.*

Contrails From The Past

by Ed Rusinek

Dear Ed,

I am renewing my NAA Retirees Bulletin subscription. It has brought me a great many fond memories of my years at North American. I started on February 14, 1941 in the extrusion fabrication section of Department 2, commonly known as "Bolt Angles" production of the B-25. The P-51 and the T-6 were being accelerated or just getting underway. At the time, extrusion fabrication was mostly skilled hand work and soon we were working two eleven hour shifts, seven days a week. Days off for employees were staggered. Wednesday was my day off.

To keep pace with production needs; numerous tools, such as roll form dies and the Rudd Bender, were tried. All methods had the same side effect of "spring back" and the replacement of 24S with 75S Aluminum alloy added to the problem. A "stretch form" concept was introduced. When subsequent experiments showed promise, the project to construct the "tool" was undertaken. I was assigned to the task as a "gopher." The tools used by Manufacturing became of interest to me and I began night classes at the Frank Wiggins trade school, in Downtown Los Angeles to study tool design.

The prototype tool proved to be a success! Hufford, a small hydraulics manufacturing company located in El Segundo, California, was given the rights to manufacture and market the tool that became known as the Hufford Stretch Form Machine. Just before I left to join the Army Air Corps as a cadet, the first extrusion stretch form machine, produced by Hufford, was delivered to North American Aviation.

After my discharge from the Army Air Corps, I returned to NAA and was assigned to the Planning Department working on the rerelease of the P-82 Twin Mustang. In the years that followed, as NAA grew into a huge Aerospace Corporation, Manufacturing met the challenges of new products and materials with new tools and methods. I retired in 1979 with 38 years of service, mostly at LAD with several years at Autonetics and the General Offices.

A BIG thank you to all who contribute to the Bulletin. Each issue brings back memories and pride in the accomplishments of the Company.

— Lowell Ehrhardt, Pasadena, CA

Ed's Resp.: Lowell, you reflect that North American Aviation pride and attitude which made our Company the very best of the best. As the Editor, it gives me great pleasure to publish your account of the struggles that confronted our company in its early days.

Dear Ed,

I was hired at LAD in 1948 as a truck driver. Eight years later, I transferred to Rocketdyne as a leadman and dispatcher. Five years later, I was promoted to Assistant Foreman and then Supervisor in Transportation at Space Division in Downey for the next 31 years.

We truck drivers, chauffeurs, dispatchers and supervision accomplished a multitude of tasks without a single mishap. We transported every GAM-77 "Hound Dog" from Downey to Butler Hangar in Long Beach and then two each aboard the C-124 aircraft and three each aboard the C-131s.

Similarly, we moved all the Apollo Command/Service Modules and loaded them aboard the "Pregnant Guppy" and the "Super Guppy" for transport to the "Cape". Upon retrieval by the Navy, we would bring the Command Modules back to Downey.

We also moved each S-II stage, 33' wide x 40' high x 65' long, from the Seal Beach facility to the Anaheim Bay Dock in Seal Beach for the 14 day trip to New Orleans where they were transferred to a river barge for testing at MTF and then to an ocean barge to the "Cape".

We didn't have the equipment big enough to move the Shuttle Orbiter so we contracted a trucking company that could. We served as wing walkers for the 26 miles move from Palmdale to Edwards AFB. Our purpose, walking the distance was to alert the driver by walkie-talkie of any clearance problems.

Our chauffeurs transported many of the astronauts and other visitors to various locations without incident. We all were part of the North American Aviation Team!

— Frank Chudoba, Van Nuys, CA

Ed's Ans.: I could easily see why you ran a smooth ship, Frank. You always spoke of "We", and not "Me".

Congratulations and Best Wishes to

Erwin and Myrna Ulbrich of Whittier, California
celebrating their 60th Wedding Anniversary

I asked the Lord in heaven above,
to help me find someone to love.
A caring person, loyal and true...
He heard my prayer and sent me you.

The Silent Majority

by Stan Guzy

BLUMHAGEN, VERN A., 85 – passed away in Vida, OR on October 27, 2014. Vern joined Autonetics in Downey in 1958. His first assignment was to develop the equations for the on-board computer for the inertial guidance system on the B-70. The design of the inertial guidance and navigation systems for a multitude of projects followed. Promotions followed until Verne was appointed Director of the Advanced Analysis Department of the Research and Engineering Department. However, in 1970, most of the programs came to a crashing end, resulting in massive lay-offs. In 1983, Vern received the "Engineer of the Year" award and retired in 1987. He is survived by his loving wife of 59 years, Marilynn.

DITTUS, ELMER R., 96 – of Los Angeles, CA, passed away on September 3, 2014. After returning from service during WWII, Elmer graduated from North Dakota Agriculture College as a mechanical engineer. He joined LAD in 1951 as an engineer on the F-86, F-100 and the F-107. He moved to the X-15 and worked on the hydraulics, flight control and landing gear systems. After a year in St. Louis on the F-15, he returned to the B-1 and, subsequently, to Space where he was on the Shuttle program until he retired in 1984 with 32 years of service.

FINTON, JOHN M., 83 – passed away on September 6, 2014 in Yorba Linda, CA. Earning a degree in Geology from Michigan State University, John joined NAA and participated in many successful projects until he retired in 1989 with 20 years of service. He is survived by his wife, Shirley.

HEWITT, GEORGE F., 94 – passed away on February 10, 2014 in Rogue River, OR. George served as an engineer at Rocketdyne for 29 years when he retired in 1983. He is survived by his loving wife of 69 years, Etta.

KELCHNER, DONALD E., 86 – of Villa Park, CA passed away on September 8, 2014. Don received a Business degree from UCLA in 1955 and retired from NAA/RI in 1988.

KOELLER, FRED B., 95 – of Manhattan Beach, CA passed away on October 6, 2014 surrounded by his loving family in the home he designed and built in 1958. Returning from the Navy after WWII, he attended UCLA. He retired from LAD in 1984 with 44 years of service in Engineering, M&P and Manufacturing. During his service, Fred shared a patent for Superplastic Forming of Metals.

KOZMATA, JOSEPH W., 87 – passed away on September 29, 2014 at home in Mission Viejo, CA. Joseph earned a degree from the University of Denver before joining McDonnell Douglas in California. He retired and joined NAA/RI until he retired. He is survived by his partner, Linda Burkholder.

KREJCI, MILAN D., 83 – died peacefully at home in the San Fernando Valley, CA on September 1, 2014. Attending UCLA, he served at Rocketdyne until he retired in 1990. He is survived by his wife, Florence.

LEUE, ALAN C., 84 – passed away on September 25, 2014 in Santa Barbara, CA. Attending Cal Poly SLO, Alan served with NAA until his retirement in 1987.

MAYNARD, ELLA JEAN "JEAN", 87 – of Long Beach, CA succumbed on October 6, 2014 after a very long and courageous battle with sciatica. Jean was a wonderful person, an efficient secretary that cranked out flawless work fast and a caring friend. She retired in 1993 with over 22 years of service as secretary to Pat Hanifin, Director of Structural and Mechanical Design. Her laughter and charm will be sorely missed!

REPLOGLE, JACOB L., 86 – passed away at home in Placentia, CA on September 27, 2014. Jacob was at several companies, including Space Division where he served on the Saturn V, Apollo and Space Shuttle. He is survived by his loving wife, Teddie Jean.

SMITH, PHILLIP S., 81 – of Lancaster, CA passed away on May 29, 2014. He served in Quality Control at Space, Rocketdyne, Sabreliner and B-1 Divisions. He retired in 1988. Phil was enthralled with Bonneville racing cars. He is survived by his wife, Sharon.

LOST SHEEP, BULLETIN RETURNED WITH NO FORWARDING ADDRESS

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RONALD J. "AL" WESTBROOK – OJAI, CA

LEROY & JOYCE WOLFF – SAFETY HARBOR, FL



Photo courtesy of John Tribe

John Tribe's grandson, a visitor from England, admires the enormity of the Saturn V rocket from the newly dedicated North American Aviation Memorial Bench in the Rocket Garden at the Kennedy Space Center Visitors Complex.

"Teamwork is the ability to work together toward a common vision. The ability to direct individual accomplishments toward organizational objectives. It is the fuel that allows common people to attain uncommon results."

— Andrew Carnegie

NORTH AMERICAN AVIATION
RETIREES BULLETIN
P.O. Box 3797
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North American Aviation Retirees Bulletin

"Where The Best Never Rest"

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IF THE DATE ABOVE YOUR NAME IS DECEMBER 2014 AND YOU HAVEN'T YET RENEWED –

THIS IS YOUR LAST ISSUE!



"Dual Victory" *by Richard Taylor @ The Military Gallery, Ojai, CA*

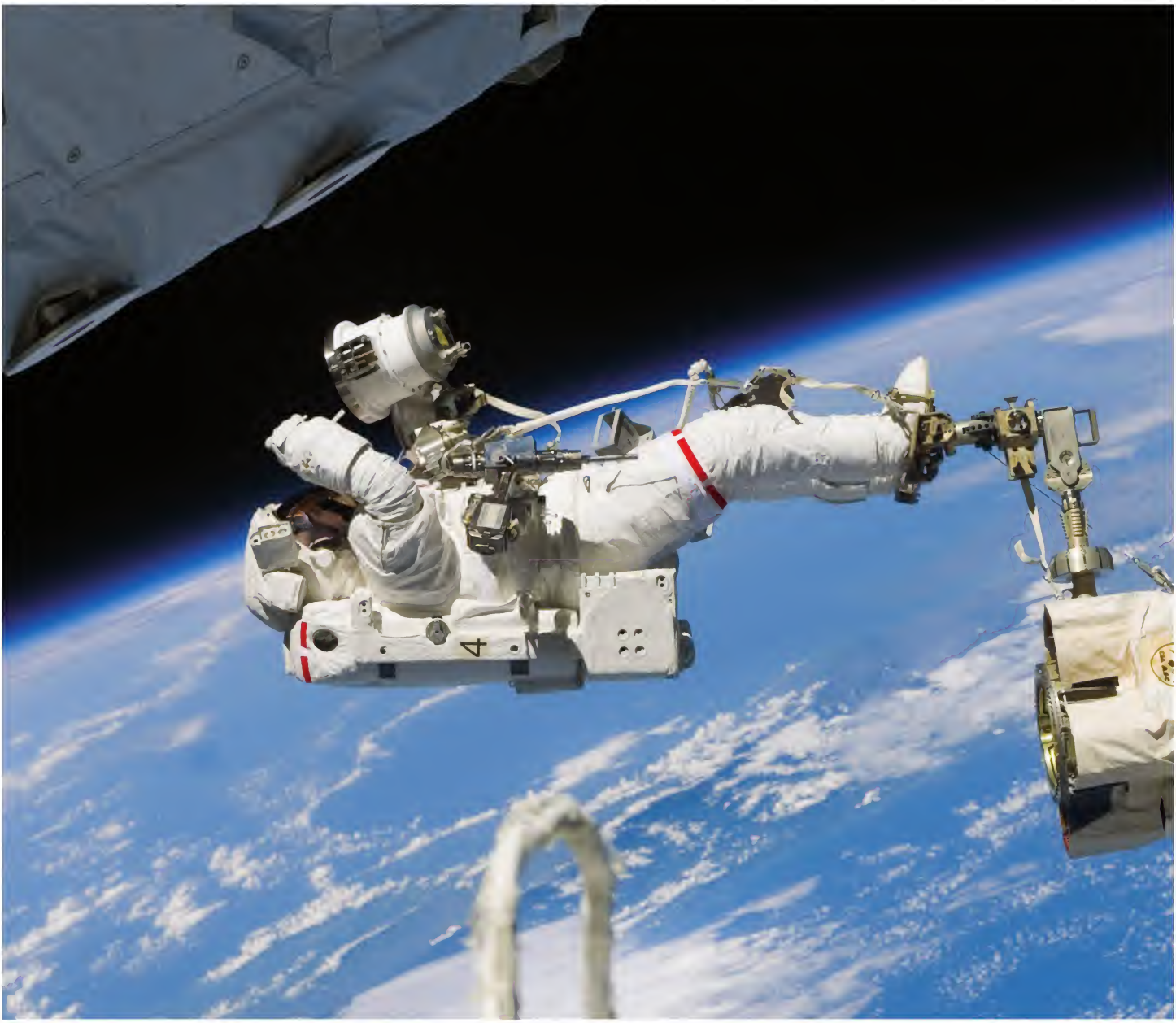
Too young to join the U.S. Army Air Corps, Clyde East joined the Royal Canadian Air Force, earned his wings and commission and was sent to England to fly interdiction missions over Occupied Europe. In 1944, he transferred to the USAAF 15th Tactical Reconnaissance Squadron, flying the F-6D, a modified photo recon version of the P-51D Mustang. On 24 March 1945, returning from a recce over Schweinfurt with photos already in the can, Clyde encounters six Me 109s. Artist Richard Taylor brings to life this spectacular dogfight over Eisenach when flying his legendary "Lil Margaret", he shoots down one and lines up to add a second. Clyde completed over 200 singular sorties with a total of 13 victories.

NORTH AMERICAN AVIATION
Retirees Bulletin
"Where The Best Never Rest"

Spring 2015

Inside:

THE NORTH AMERICAN NA-40 ATTACK BOMBER by Norm Avery
THE T-28D "TROJAN", A TRAINER WITH CLAWS by Erwin Ulbrich
WITH THE T-28D "TROJAN" IN LAOS by Edgar Covey
AN ASTRONAUT'S STORY by Jerry Ross



NASA photo via Jerry Ross

Attached to the foot restraint of the International Space Station's robotic arm, Astronaut Jerry Ross installs a large light to the outside of the Space Station during his final spacewalk on his last Space Shuttle mission, STS-110, in April 2002.

NORTH AMERICAN AVIATION
Retirees Bulletin

North American Aviation Retirees Bulletin, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAA Retirees Bulletin can be contacted at The Boeing Company, Seal Beach facility by phone at (562) 797-3836. Send mail to:

North American Aviation Retirees Bulletin
P. O. Box 3797
Seal Beach, CA 90740

NAA RETIREES BULLETIN VOLUNTEERS
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Dear NAA Retirees Bulletin Subscriber

We begin the New Year with another quandary. We have petitioned the United States Air Force Academy for permission to install a black granite North American Aviation memorial bench on the campus grounds and have been refused on the grounds that we represent a private business in accordance with the interpretation by their lawyers. Our response is that we represent the Bulletin and several thousand living retirees of a company that ceased to exist some fifty years ago. Since the bench would be located where future officers are being trained, we added the following words to reflect our role in the past:

* PROVIDING THE WEAPONS TO MATCH THE COURAGE *

Our authors for this edition of the Bulletin ran the entire gamut of possible literary resources. Since things looked pretty bleak after the Winter Issue came out, we reached back into the past and came up with an article given to us by NAA Historian Norm Avery many years ago. Unfortunately, he died about a year ago but his draft on the NA-40 bomber was still with us. The project ended being a bust but it led to the very successful B-25 Contract. Talk about determination! Our Erwin Ulbrich spent some time in the hospital recently getting his heart checked out but that did not stop him from providing us an article on the conversion of the T-28 trainer at Columbus into a mean T-28D attack aircraft. We contacted our newest volunteer, John Fredrickson, at the Boeing Historical Archives in search of T-28D photographs. He not only found some photos but he told us about a friend, Edgar Covey, who served in a USAF Black Ops in Laos with the T-28Ds. We called Edgar and he very graciously filled us in on some aspects of life in a combat zone where they take away your guns and provide you with a card telling the enemy that you are a non-combatant. (Gee! Sounds like the White House today.) Last, but certainly not least, our guest speaker at the Bald Eagles luncheon this year will be Astronaut Jerry Ross. We spoke to him and learned that he holds the record for most Space Shuttle missions and, although he never was chosen first, he would work harder and make the grade. In short, he is the "Go To Guy". He also provided us with a small article about himself. He would also serve as a good model for young people. The race doesn't always go to the swiftest but always to the most persistent!

With the new year, we again searched for a technical speaker to send to the Air Force Academy and we came up with a fantastic person. He is Dr. Dan Raymer. He was at LAD and he has led the way in advanced design of super flight machines. He is a great representative for North American Aviation, and the folks at the Academy work with his textbooks and they are thrilled to have him come to the campus!

Over the past fifteen years we have asked many, many people to help us out with paintings, articles, pictures and introductions. All have come forth and never asked for any compensation. It is time to say thank you! In this issue we have a page dedicated to four of our authors that have published books. Please look over their ads and see if any are of interest to you. If you are like me, the old eyes are making it harder for you to enjoy reading but give it a try! Perhaps, you will find something for a grandchild to stimulate their thinking about their future.

Our Volunteer Staff Members, Sonnie Robertson, Nolan Leatherman and Stan Guzy are going through some severe major medical issues! Please remember them in your prayers. And in this horrible time of strife, also remember all our service men and women scattered all over this crumbling world. Prayers from the heart are never wasted!

Every year when it comes time to renew subscriptions, we learn that more of our readers have joined the Silent Majority or are to some degree incapacitated. If you have a friend in some assisted living facility, why not throw them a line of reality and send them a gift subscription! They will breathe a sigh of relief when they don't see their name listed in the Silent Majority.

Hopefully, we shall see you at the Bald Eagles 2015 Luncheon on Saturday, April 25th at the Golden Sails in Long Beach.

The North American NA-40 Attack Bomber

by Norm Avery

Attack aircraft of the late 1930s were of the single engine type and none proved entirely successful. A single engine had become inadequate for the ever increasing requirements for speed, armament, bombs and other stores necessary for effective strikes against mechanized forces.

Thus, in 1937, the Material Division of the Army Air Corps decided to explore the possibilities of a twin-engine attack plane with increased performance and strike capability. On the negative side, such a design represented a considerable increase in cost and weight. Furthermore, a probable reduction in maneuverability could result in greater vulnerability to ground fire. A significant increase in speed was, therefore, considered an utmost necessity, and with higher speeds the bomb load took on greater importance than forward firepower, although the latter remained a requirement. To contribute to surprise attack approaches, over-the-wing exhaust tail pipes were favored.

With basic features determined, in March 1938 the Air Corps issued Circular Proposal Number 38-385, defining the requirements for a modern twin-engine attack bomber. Generally specified was a 1,200 pound payload and a range of 1,200 miles at speeds well in excess of 200 mph.

Responses were received from Bell, Boeing-Stearman, Douglas, Martin and North American Aviation. Except for the Bell entry, powered by two liquid cooled in-line Allison engines, the others utilized air cooled radial engines. All were of metal construction and incorporated retractable landing gears and internal bomb bays. The Martin and Boeing-Stearman entries retained the "tail-dragger" configuration which was rapidly falling from favor.

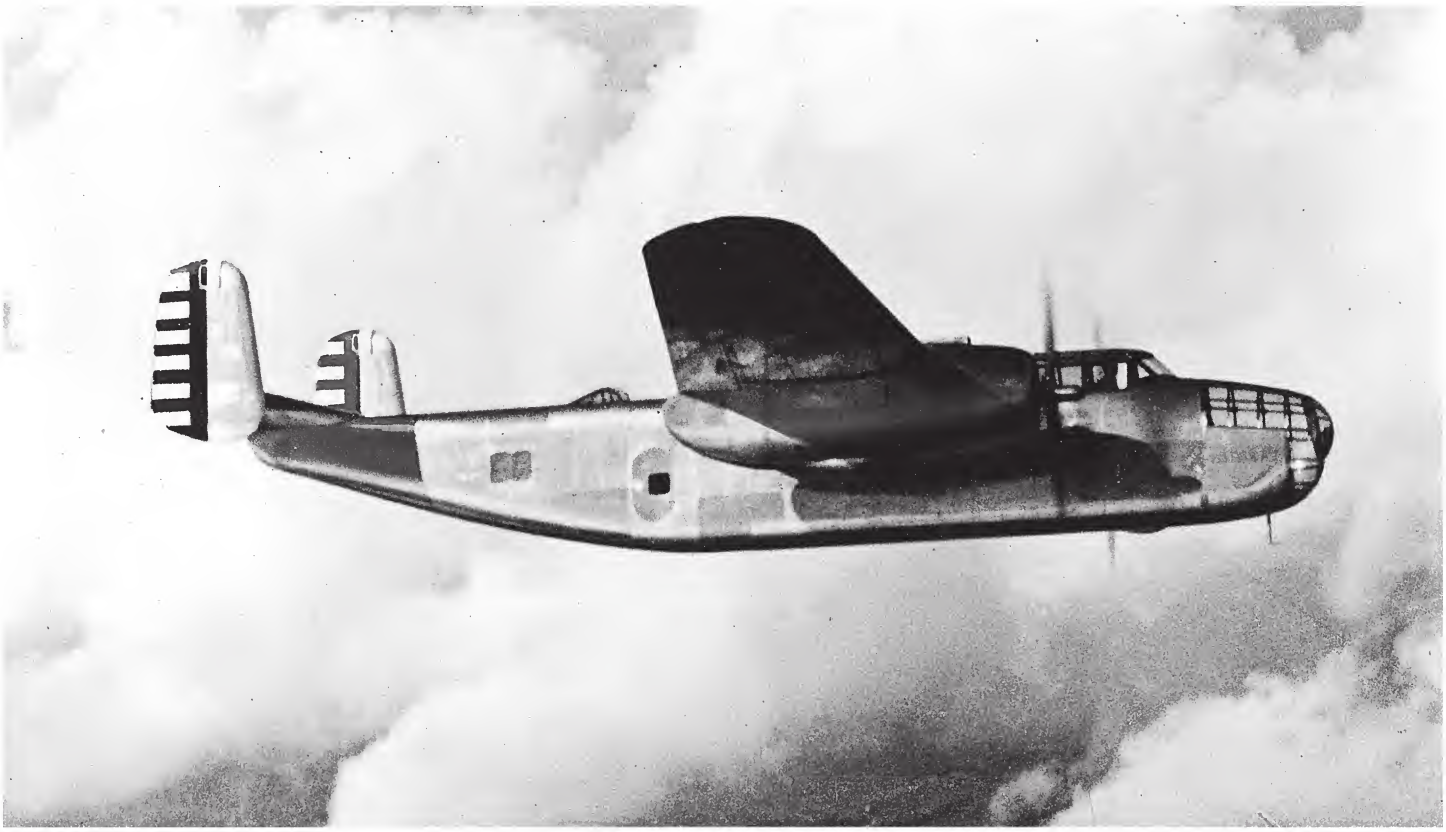
The competition seemed jinxed from the start, some good concepts notwithstanding. Although an impressive design, the Bell Model 9 was withdrawn from the competition for unknown reasons. On January 23, 1939, the Douglas 7B was being demonstrated to French representatives at Los Angeles when, during a single engine fly past, it went into a flat spin and crashed, ironically in the North American parking lot, killing the test pilot and seriously injuring a French observer aboard for the flight.

Thus in March 1939, only three airplanes showed up at Wright Field for the attack bomber competition, all being there at the manufacturer's accountability – the Boeing-Stearman X-100 (no registration), the Martin M-167 (NX22076) and the North American Aviation NA-40B (X14221).



Boeing Archive photo

The completed North American NA-40 with its two Pratt & Whitney R-1830 engines in January 1939.



Boeing Archive photo

The North American NA-40 in flight.

North American's entry in the twin-engine attack bomber competition began in 1938 as the company model NA-40. Its engineering design team, headed by Howard Evans, succeeded in producing an efficient, functional airplane, exceptionally clean by any standards and incorporating excellent features.

The design was based on a crew of five – pilot, copilot, bombardier/navigator, radio operator/gunner and gunner. The pilots were placed in tandem under a long, slender canopy, an arrangement that minimized frontal area and permitted a maximum fuselage width of a mere 45 inches. A "greenhouse" type nose housed the bombardier/navigator, with the radio operator and gunner positioned aft.

Shoulder mounted wings provided for fully underhung nacelles, a concept first introduced on the Fokker XO-27/XB-8 and followed by the XB-21 Dragon (1938) and all subsequent twin engine bombers designed by North American Aviation. This feature provided maximum internal space for the retracted landing gear and accessories, resulting in excellent maintenance access. It also minimized disruptive airflow over the wings, contributing to aerodynamic efficiency.

Power was initially supplied by two Pratt & Whitney R-1830-S6C3-6 engines of 1,100 hp, driving twelve foot diameter, three blade Curtiss electric propellers. Each exhaust collector terminated in a single stack directed upward just aft of the carburetor intake scoops. Total fuel capacity was 476 gallons.

Pratt & Whitney supplied North American with installation drawings and data for their R-1830, R-2180 and R-2800 engines, all of which were approved for the bid. Preliminary designs were prepared based on each type, but only the proven R-1830 was selected. It is interesting to speculate on the probable performance of this light airplane had it been equipped with the R-2800 engines. They were far in the future, however, not having yet reached the test stands.

Typical of the period, armament was light, consisting of three .30 caliber flexible guns with 500 rounds of ammunition for each. One gun was ball mounted in the nose, one in the top turret and another aft, portable, between waist and ventral locations. Bays of two fixed .30 caliber guns were designed into each wing between the oil cooler air intakes and the landing lights, but wing guns were not installed until the airplanes were reequipped with Wright R-2600 engines and designated NA-40B.

Since a considerable portion of North American's business during the 1930s had been the export of military airplanes to foreign nations, this was also considered for the NA-40, and a proposal was prepared for the export version powered by Bristol Pegasus engines. Nothing was to come of it, however.

Company pilot Paul Balfour and test engineer Lyons made the first flight on January 29, 1939 and immediately experienced severe tail shaking which intensified as the speed increased. Various combinations of cowl flap settings, some fixed and others controlled, made some improvements but only resulted in erratic oil and cylinder head temperatures. Elbows and long tail pipes were fitted to the exhaust stacks and a squared fairing was fitted to the nacelle trailing edge. Some improvement resulted but the problems remained and were never totally alleviated with the Pratt & Whitney engines. These difficulties and the slow feathering of the Curtiss electric propellers deferred single engine tests indefinitely. As a result, only fourteen flights, totaling five hours and twenty minutes were made with the P&W engines. During these tests, a top speed of 265 IAS was attained, satisfactory if not spectacular.

Between February 28 and March 1, the P&W engines were replaced by Wright R-2600-A-71-3 engines of 1,600 hp and the airplane was redesignated NA-40B. The more powerful Wright engines with more streamlined cowlings provided considerable improvement in both performance and appearance. The over wing exhausts were replaced by collector rings ported outboard of the nacelles and the carburetor intake scoops were moved slightly aft.

It was intended to equip the airplane with Hamilton Standard Hydromatic propellers capable of full feathering in much less time than the Curtiss electrics. The Hamiltons were not available, however. So, to expedite the test schedule, a tank of storage batteries was substituted to assist feathering the Curtiss propellers.

On March 1, 1939, Balfour and engineers Lyons and Wheeler flew NA-40B for nearly an hour. Airspeed calibrations and simulated single engine tests were successfully completed, and no vibration or overheating problems occurred. The single difficulty was excessive and persistent spark plug fouling on the No. 9 cylinder of each engine, a problem temporarily corrected by fabricating substitute harnesses from friction tape.

On March 12, Balfour, Lyons and North American technical representative Rudy Stolz departed Mines Field in Inglewood for Wright Field, Ohio, where demonstration tests for the Air Corps were programmed. Scheduled stops for fuel and inspection were made at Albuquerque, New Mexico and Kansas City, Kansas.

Upon arrival at Wright Field, the trial board flights were begun by Major Younger Pitts, temporarily assigned as military test pilot to the NA-40B project. A considerable portion of the programmed tests were completed with satisfactory performance, but due to the slow feathering characteristics of the Curtiss electric propellers, no single engine tests were made with a shut down engine and fully feathered propeller. To simulate shut down, engines were alternately idled with the propellers in full high pitch and the airplane trimmed to approximate hands off flight. North American had requested that no dead engine and full feathering tests be done until all programmed trial board flights had been completed and, further, requested that a company technical representative be aboard for such tests.

On April 11, Pitts taxied NA-40B out for takeoff. Stolz was in the copilot seat and Lieutenant Anderson in the aft fuselage. Captain McGuire made a last minute arrival by car and indicated that he wanted to make this flight. Stolz, thereby, relinquished his position and the plane took off with Pitts, McGuire and Anderson aboard.

Shortly after takeoff, they approached the field at about 500 feet altitude and with one engine shut down and feathered. On one engine, the plane flew neatly over the field and away from it, turned slightly, lost some altitude, then slid into the first turn of a flat spin. It struck the ground two miles from the field and came to a crumpled stop.

Stolz, who had watched it happen, joined the fire engine crew rushing to the crash side and arrived to find, with a sigh



Boeing Archive photo

In the 1930s, One-of-a-Kind Airplanes like the NA-40 were usually assembled in One-of-a-Kind Corners of the Shop.



Boeing Archive photo

With the Wright R-2600 engines, the plane became the NA-40B. The buffeting problem was solved but the airplane crashed due to pilot error. Notice the North American O-47A observation aircraft in the background.



Boeing Archive photo

Although not the actual prototype for the B-25, the NA-40 was the most direct predecessor with tricycle landing gear, R-2600 engines in underslung nacelles and twin vertical fins. The pilots, however, were seated in tandem.

of relief, all three crew members waiting, safely separated from the crashed airplane by a small hill. The fuel soon ignited, totally destroying the NA-40B. Except for a small cut on Captain McGuire's head, there were, miraculously, no injuries.

Although the loss of the airplane was a significant setback to North American, Dutch Kindelberger maintained his usual good customer relations. For each of the lucky officers, he purchased a watch, the backs appropriately engraved with a rabbit's foot.

Testing of the NA-40B was not quite complete but the recorded data was adequate proof of a design of excellent capability and potential. North American had failed to win a production contract for the NA-40, as it had failed to win a contract for the NA-21, but the loss was brief. Both played a significant role in the next North American bomber project – the model NA-62, which was to become famous as the B-25 Mitchell bomber.

As for the attack bomber competition, Stearman and Martin each received a contract for one test vehicle – the Stearman XA-21 and the Martin XA-22. Later in 1939, the Douglas design, already ordered by France as the DB-7, was selected for production with 63 being ordered as the A-20, to fill the need for the Air Corps' need for a twin engine attack bomber.

Early on the morning of April 12, 1939, which was barely enough time to allow the wrecked and fire-ravaged remains of the NA-40B at Wright Field to cool off; General "Hap" Arnold dashed off the following letter to James H. Kindelberger:

Dear Dutch:

I certainly regret very much what happened yesterday to the Attack Bomber. I haven't had all the details from (Material Command Commander General) Brett this morning. I was darned glad anyway that no one was fatally injured, although one of the officers was pretty badly burned.

I just want you to know that it was as great a blow to us as to you to have it crack up. Fortunately, however, practically all the functioning tests were completed.

Kindest Regards,
H. H. Arnold
Major General, Air Corps
Chief of the Air Corps

About the Author: Norm Avery, a marvelous engineer, historian and aviation author is well known to Bulletin readers for the many articles he dedicated to the Bulletin. Unfortunately, we only discovered months later of his passing at the assisted living facility where he resided to be near his incapacitated wife. We publish this NA-40B article as a final salute to a fine gentleman and a good friend.

"The Chinese use two brush strokes to write the word 'crisis.' One brush stroke stands for danger; the other for opportunity. In a crisis, be aware of the danger – but recognize the opportunity."

— John F. Kennedy
Speech in Indianapolis
April 12, 1959

The T-28D "Trojan", A Trainer With Claws

by Erwin Ulbrich, Jr.

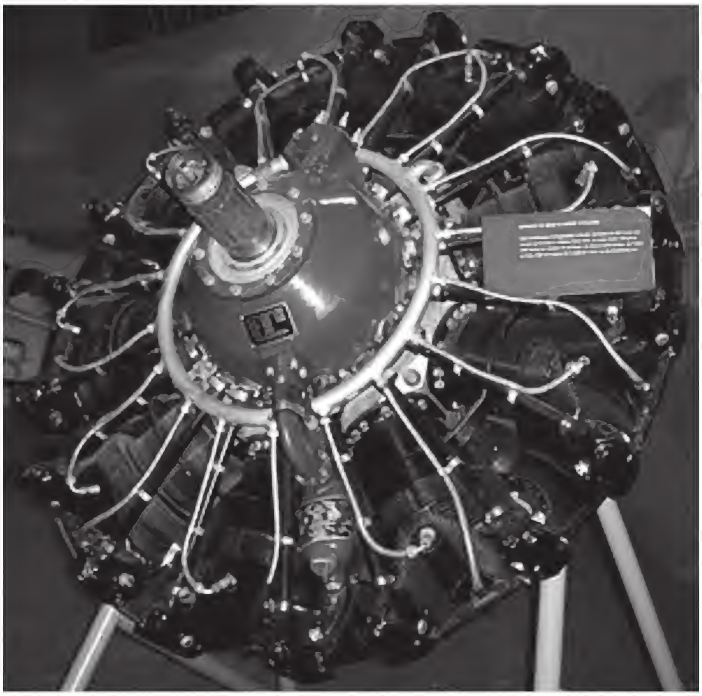
In 1949, Curtiss Wright decided to leave the aircraft production business, and instead concentrate on components. North American Aviation took over the facility in Columbus where it ultimately produced the T-2 trainer, the A3J supersonic bomber, the OV-10 observation aircraft, as well as other products. In 1949, NAA received a contract to build a military training aircraft that was very successful, the T-28 Trojan. The T-28A, the first model, intended for the Air Force, was produced in the Downey facility in California.

The T-28B, an improved Navy version followed to be built at Columbus. Improvements included a more powerful Wright Cyclone R-1820-86 engine with 1,425 hp, nine cylinder, 300-liter displacement, air cleaned unit, and a three-bladed propeller. In 1955, the T-28C went into production. It was equipped with a smaller diameter propeller and a tailhook to allow aircraft carrier landings. The Navy accepted a total of 489 "B" Models and 299 "C" Models and continued to use the aircraft until 1984.



Seeing one of these start was interesting. The starter and a pump were used to distribute lubricating oil all over the engine and then the ignition was turned on and when the first few cylinders fired, a huge burst of smoke came out followed by a throaty roar as the engine came up to speed. As a trainer, a long range was not required and so only a 700 liter fuel tank was used, giving about 3 hours of operation at cruise of 200 knots or 48 minutes of operation at 330 knots.

In 1962, the Columbus Division received a contract to convert war-weary T-28Cs to T-28Ds. These used aircraft were to get





Boeing Archive photo

mechanical inspections, new engines and 6 bomb/rocket hard points under the wings capable of accepting a variety of weapons from gun pods and rockets to napalm and 500-pound bombs.

The whole project was understood not to be disclosed to the press or public and was a forerunner of many dark projects to come. The contract came from the CIA, who desired a Counter Insurgency warplane for use worldwide in places like Laos, Morocco, etc.

In Laos, the T-28D was used with a light aircraft called the O-1. The O-1 carried a Forward Aircraft Controller (FAC) who would find ground targets for the T-28Ds on call. It is obvious that it was dangerous for the O-1 especially since they had to stick around and do ground damage assessment after an attack.

These aircraft then comprised the Royal Laotian Air Force. They would later on also comprise the South Vietnamese Air Force. One of them was hijacked by the insurgents and became the first aircraft in the North Vietnamese Air Force.

The cockpit was mainly three inch and two inch steam gauges and proved very durable. The aircraft was not pressurized and was intended for use at low altitudes.

In the T-28D, typically, the armament controls were added on the right hand side and there was center switch which dropped everything at once. The back seat was often used by a local translator who could assist the pilot in communication.

Strategically, these aircraft arrived in Laos in 1963 and 1964 where the United States had taken over where the French had left off in resisting various insurgencies. There were a few Laotian pilots, but missions were mainly flown by CIA operatives with various cover stories. This was all about 3 or 4 years before the Gulf of Tonkin affair and was obviously a prelude. Starting here, the aircraft was heavily used by a Black Ops project called the USAF "Raven" Forward Air Controllers in Laos which continued well into the Vietnam War. It was dangerous work with as much as 30% fatalities. In the end, both wars were unsuccessful, but for a time, a small town factory in Ohio built the entire Royal Laotian Air Force without any publicity using pre-owned NAA airplanes.



About the Author: Erwin's experience ranges from the Manhattan Project to Aviation Integration on the B-2A Stealth Bomber. At NAA-Columbus, he served on the T-2, A3J and the Roadrunner Projects. At NAA Downey, he worked on the Apollo, S-II and Advanced Apollo Programs. He also dedicated 20 years to teaching at UCLA. We anticipate many more articles from him in the future. Erwin resides in Whittier, California with his charming wife, Myrna.



Boeing Archive photo

With the T-28D "Trojan" In Laos

by Edgar Covey

I salute all the men and woman that designed and built the North American Aviation "Trojan". This was a military weapon that the enemy did not like to hear coming. And believe me, the Hmong Laotian locals could hear them long before I could.

Yes, I was in Laos during the Vietnam War, from 1972 to 1973. I was part of Project 404. PDS Det 9AB, 1131 USAF Special Activity SQ. It was a Black Ops assignment, but I guess everyone knew we were there! I lived in Savanket, Laos—right next to the Mekong River and directly west of the DMZ. I couldn't wear a uniform for a year, and I had just made buck sergeant. They took away my military ID and gave me an Embassy ID card and a very little Geneva Convention booklet, which we were to give to the enemy if we were captured.

When I got to my duty station, I asked, *"Do we really give this to the enemy when captured?"* They all whipped out their Zippo lighters at once and said, *"Burn it! We will all be shot as spies if we get captured!"* Scotty, our supervisor, said that's why there is always a chopper on standby at the airfield. And I was to be the first on it, because I was the Communications Tech that could fix everything. On the radio, our call sign was "Texas site". Around town and on the ground, I was called "Mr. Ed". I don't know why, I guess the locals had a lot of respect for me because I helped everyone. Our group just called me Ed. Rank was never mentioned.

Well, after a couple weeks of working with these guys, I informed Scotty, *"All the incendiary devices in the Comm Center are wired together and a switch was installed by the door. The last man out, is to hit the switch and we all move together to the airfield."* (Fully armed of course—Scotty with his Thompson submachine gun—where he got that I do not know; me with a B.A.R. and a grease gun; Travis with two M-16s and Mac with his M-16.)



Edgar Covey photo

In 1972, 21 year-old USAF Sergeant Edgar Covey, assigned to a Black Ops unit in Laos, used a bicycle until he repaired an abandoned truck that would become used by the entire unit.

Some of my time was spent on the radio relaying information about enemy locations to the T-28D pilots in the air, who were Laotian and, what I was told, were "60 Day Wonders"—they were taught English in 30 days and then they were taught how to fly a T-28D in 30 days. These men where the best of the best and it was a pleasure working with them.

I was at the airfield one day, fixing a language learning station. I watched a T-28D landing and the pilot kept the nose wheel from touching the runway for the longest time. In fact, until his speed was so slow it had to come down and make contact. I mentioned to Bruce, how cool that was that he could keep that nose wheel up most of the way down the airfield when landing. He replied, *"Yeah! They like to show off their skills as a pilot and they really like flying the T-28D."* I agreed with him, *"Yes, they are devoted to their country."*

We had to go by the rules, but they could opt out. Sometimes, when they gave me coordinates of an enemy location, I would relay back to them saying there is a structure within 50 yards—do not engage. They would come back many times and say "the structure was already blown up." Then, only a few minutes later, the pilot would key his mike and I could hear the roar of a T-28D in a dive bomb run. I loved it and would turn up the volume when they did it. It was the pilots' way of saying, "Screw the rules, this is war!"

The enemy did get close two times. Close was a mile away. You could hear it. When an enemy tank got close to us one time, our T-28D pilots took out everyone with it so the ground troops could capture it and bring it to the airfield as a trophy of war. It sat next to the airstrip for a while, Chinese made and completely intact. Another time, they got too close and overran a village, killing two young American missionary girls. Two missionary doctors were saved by the villagers, but the girls were on the other side of the village where the enemy came in. The T-28Ds took out the enemy's transportation so they couldn't get away and an AC-47 "Spooky" finished them off. If you have ever watched a Spooky unload over 20,000 rounds of ammo, you would never forget it.

Three days later, the Colonel asked if I could set up a new generator and run a power panel and lighting. Well, I did it in 5 hours and had dinner with the two doctors. Then a villager came to me and said the Colonel was coming to get me. It was about 3 minutes before I could hear his UH-1 chopper coming. I was 21 years old but the Hmong had better hearing than I had!

I would like to thank all my fellow Vietnam War vets and wish them Happy 50th Anniversary. I will make another trip to the Wall in D.C. On my previous visit, I knelt down and put my hands on the Wall and said a prayer of thanks to all those that did not come home with us. I never did get the chance to thank Scott Miles for getting me the USAF Joint Service Commendation Medal and Citation when I reported to my next duty station.

To all of you North American Aviation Retirees, THANK YOU VERY MUCH! It is an honor to share with you my experiences with the T-28D Trojan. You built a magnificent airplane.

— Edgar Covey, USAF 1970-1977, Federal Way, WA

An Astronaut's Story

by Colonel Jerry L Ross

I grew up in the country outside of Crown Point, Indiana, in the 1950s. For the most part, I was a typical country boy who played with toy tractors in a sand pile, rode my bike along the gravel roads, and played sports with my friends. But I had one unique fascination – Outer Space. I made scrapbooks about rockets and satellites before the first satellites were launched. When I was in fourth grade, those first satellites were launched. I decided right then and there that I was going to go to Purdue University in my home state of Indiana, that I was going to be an engineer, and that I was going to get involved in our country's space program.

I knew that if I was to become an engineer I would have to earn good grades and that I would have to save money to help pay for my education. Although I wasn't a straight A student, I studied hard.

Even though I experienced several setbacks, I was determined to achieve my goal. Two of biggest disappointments were not being able to go to the Air Force's Test Pilot School the first time I was selected and not making it into the astronaut program on the first try. But I never gave up, I tried harder.

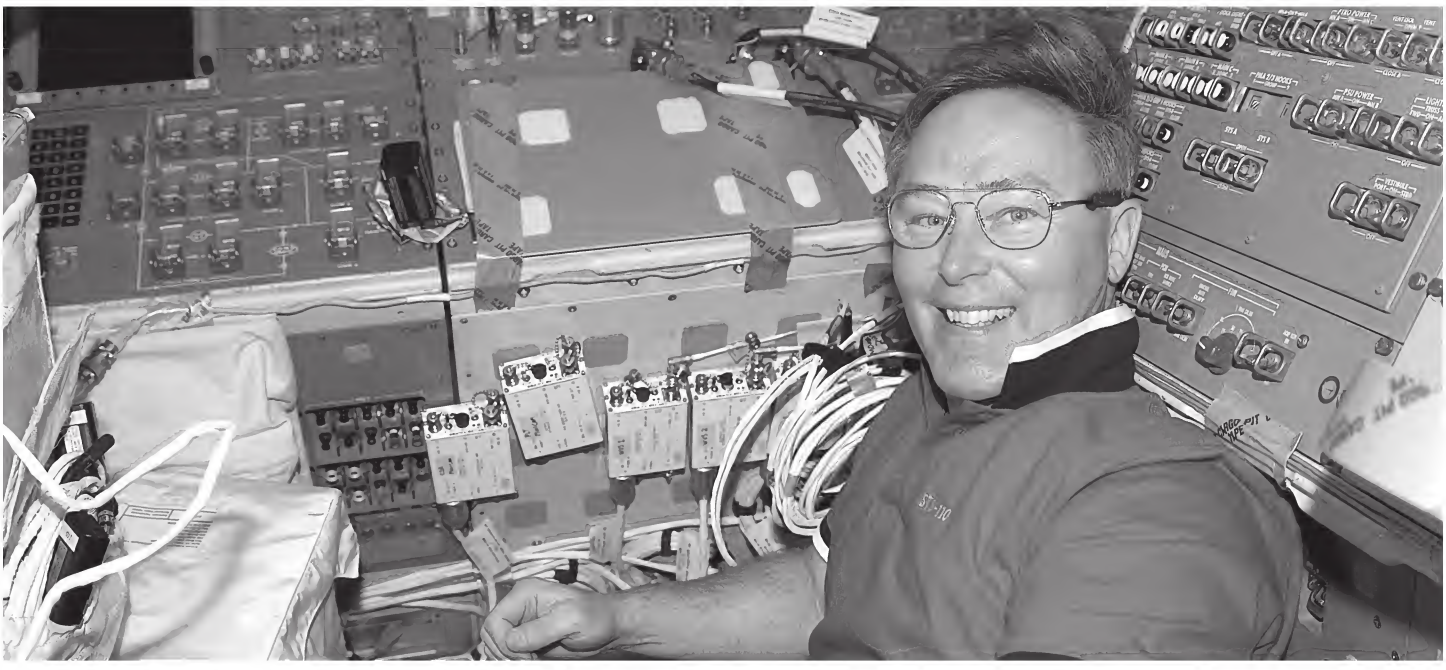
After graduating from Test Pilot School, I was a flight test engineer assigned to Edwards Air Force Base. I helped perform the flight testing of the B-1A bomber. Some of the testing was performed at speeds above Mach 2. I was the Air Force lead for stability and control and flight control testing on the B-1A, and for a while served as the Air Force's chief flight test engineer on the B-1A Program.

I was selected as an astronaut in 1980 and was part of the Space Shuttle Program from before the first launch through the final landing. On November 26, 1985, at 37 years old, I rode the Space Shuttle *Atlantis* into space for the first time, fulfilling my childhood dream. During that mission, I helped launch three communication satellites and performed two spacewalks to investigate ways to assemble structures in space. Subsequent



Jerry Ross photo

Jerry L. Ross stands in front of the B-1A bomber at Edwards Air Force Base.



NASA photo

Astronaut Jerry L. Ross works on the middeck of the Space Shuttle* Atlantis *during mission STS-110.

Shuttle flights included deploying a classified military payload, launching the Compton Gamma Ray Observatory, conducting nearly 90 experiments on a Spacelab mission, visiting the Russian space station *Mir*, starting the assembly of the International Space Station, and continuing the Space Station assembly.

In the wake of the Space Shuttle *Columbia* accident, I was charged with helping to lead the three-month search for the debris that was spread over an expansive area of northeast Texas.

After the end of the Space Shuttle Program, I retired from NASA. Since then I have written two books. I am very pleased with the wonderful response of readers and hope that my books will continue to encourage young people to pursue their own exciting and rewarding careers.

Editor's Note: Astronaut Jerry L. Ross has launched into space a world record setting seven times, logging over 1,393 hours in space. During his career as an astronaut, he performed nine spacewalks and has spent over 58 hours in the vacuum of space conducting experiments, fixing satellites, and helping to build the International Space Station. He was awarded two Defense Superior Service Medals, the Air Force Legion of Merit, four Defense Meritorious Service Medals, two Air Force Meritorious Service Medals, the National Intelligence Medal of Achievement, and 15 NASA medals. He was a Distinguished Graduate of the United State Air Force Test Pilot School and the recipient of the Outstanding Flight Test Engineer Award, Class 75B. Col. Ross received an Honorary Doctorate of Science degree from Purdue University in 2000, and in May 2014, he was inducted into the Astronaut Hall of Fame.



NASA photo

On board the International Space Station, Astronaut Jerry L. Ross, STS-110 mission specialist, displays mission logos representing the record seven shuttle missions he has flown. The flights are STS-61B, STS-27, STS-37, STS-55, STS-74, STS-88 and STS-110, with the last two representing his two trips to the station.

BALD EAGLES

2015 Annual Luncheon

Special Guest Speaker:

NASA Astronaut:

Jerry Ross



Saturday April 25, 2015

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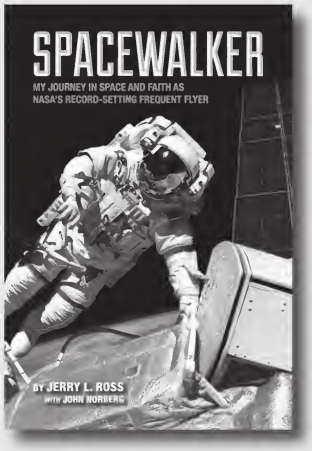
Please include meal choice:
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Welcome All! Past & Present Employees and Friends of NAA, Rockwell, Boeing
Doors open for Social at 10:00AM, Lunch starts at 11:30AM
***Register Early!* Table seating is assigned to pre-paid guests on first-come basis**
Prefer to reserve a table? Organize a group of 4 to 8 and order tickets in one check

SPACEWALKER

My Journey in Space and Faith as NASA's Record-Setting Frequent Flyer

by Jerry L. Ross



From a country kid growing up in northwestern Indiana to a world record-holding astronaut, Spacewalker will take you on my journey through life and space. You will see how God has guided my life and career. You will see how I faced challenges and obstacles. You will buckle in for the exciting ride on the Space Shuttle and experience what it is like to walk in space. And you will enjoy excerpts written by my best friend, my wife, and my kids. This book received recognition at the annual American Library Association meeting in 2014, and it is currently being translated into French. It has received outstanding reviews on the Amazon website and is about to enter its third printing since being released in January 2013.

Retail price $29.95

KANSAS CITY B-25 FACTORY

by John Fredrickson



A 128-page paperback featuring 200 high quality archival images which depict the development of the B-25, the construction of the Kansas City plant and the challenges in bringing the sustained production rate to 200 aircraft per month. Most of the photographs were only recently discovered, scanned from original photographs and are published here for the first time.

The book is available from Arcadia, Amazon.com or directly from the author. Send your check for $20.00 to:

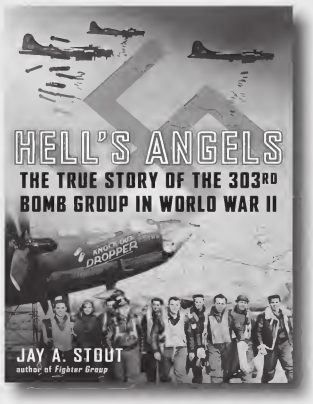
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HELL'S ANGELS

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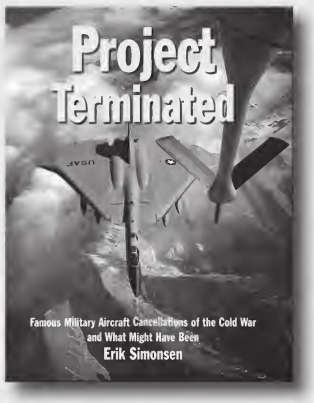
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by Erik Simonsen



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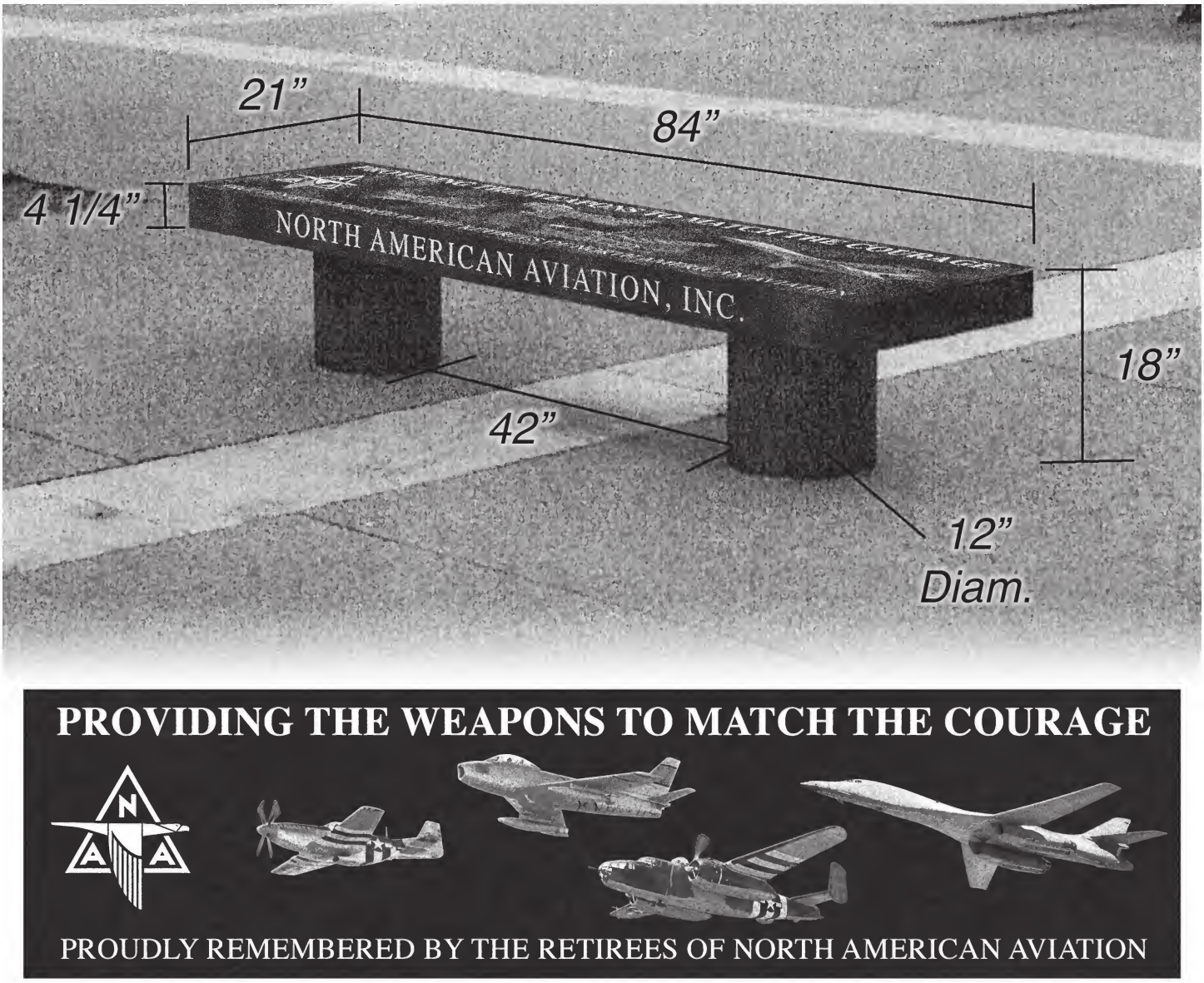
by Ed Rusinek

Total Funds Remaining for Proposed Bench at the U.S. Air Force Academy.....$3,662.05

List of New Donors Since December Accounting

Name	City	Division Affilliation	Rememberance
Charles H. Lowry	Garden Grove, CA	S&IS	
William M. Darling	Rancho Palos Verdes, CA	General	
Stanley E. Thimakis	Tustin, CA	Autonetics	In Memory of Charles Kincade, Autonetics
Michael Gleichman	Louisville, KY	Lt. Col., USAF	In Memory of my Grandfather, Robert K. Weebe, NAA 1937-1966 and my Grandmother, Maria Weebe

Total Funds Currently Available.....$4,242.05



Proposed North American Aviation Memorial Bench for the U.S. Air Force Academy Honor Court

EDITORIAL

I AM MAD AS HELL!

The Bulletin has applied to the U.S. Air Force Academy for permission to install a black granite North American Aviation Memorial Bench on the campus grounds which are dedicated to the remembrance of USAAC/USAF heroes of the past. In essence, our theme is "Providing The Weapons To Match The Courage". We were informed that there is no precedent for a private company to do this on campus. We, at the Bulletin and the few retirees of North American Aviation still alive hardly constitute a private company, know all about doing things that have no precedent to justify the action to be taken.

When we delivered the Apollo 11 Crew to the Moon and then got them safely back to Earth, there was no precedent for that either!

But all this is trivial when one looks at the direction, or lack of it, that those assigned to the task of achieving and maintaining our leadership in this crumbling world are taking.

Since my entire working life was dedicated to the Space Program, I look, firstly, towards the NASA today. All I see is a bunch of shadowy figures trying to maintain a low profile and looking ahead to their pensions.

They have scrapped the three fully operational Space Shuttles and converted them to museum trophies. If I want to look at trophies, I will go to Egypt and visit the Sphinx. They even have destroyed all means of bringing the Shuttles back and of launching them at the Kennedy Space Center. They dismantled the launch pads and have converted KSC into an imitation Disneyland!

Measuring everything by the monies wasted by a miserable Congress, someone has decided it is cheaper and easier to deliver OUR ASTRONAUTS to OUR SPACE STATION using the Russian Soyuz at $65,000,000 per Astronaut. In the meantime, we have assembled the finest group of educated, courageous scientific minds into the NASA Astronaut Corps that have nothing to do and no place to go!

At the same time, a few private companies are struggling through the same design phases we encountered some sixty years ago! It is as if all our National Interests ended with the last mission of the Space Shuttle. Our leadership, I suspect, is suffering from rectal constriction of their anterior nodules.

Fortunately, not everyone is so slow in taking advantage of what we have developed in the Space Program. While the Space Program stutters and stumbles, others have grasped what we accomplished and are using these achievements to advance their own fields of interest. Peer into the control rooms of our modern hospitals and you will see marvelous advancements of what we achieved a quarter million miles away on the Moon which then was a fantastic achievement. I, however, still have trouble retrieving my cell phone messages.

But, that is the way it should be—the old opening the doors of knowledge to make way for the young to explore, to ponder and then to achieve. To achieve in all fields of endeavor.

I have lived through the Depression, several major Wars, and the Space Program. I know what this Country is capable of achieving. And what we have today is total national chaos exacerbated by people I would not trust to take out my garbage and led by a Congress that passes bills without reading them.

Since it all starts in Washington, that is the place we should start anew:

1. Since no one read the Obamacare Bill before passing it, let us have every politician from the President on down be forced to enroll for Obamacare only.
2. Since most of the politicians arrive in Washington with two cents in their pockets and leave as millionaires, let us have each elected official submit a list of properties his family owns when they arrive and another annually during their term in office and have them justify any discrepancies outside of their salaries.
3. Since we operate on democratic principles, we give everyone a chance to express their opinion and then we decide by majority vote! So let us cut out this knee jerk reaction to every "kwacker" who puts up a stupid poster or a foreign flag and demands to have his idea adopted. If it was so good where you came from, go back! GO BACK NOW!
4. Being an immigrant myself, I am curious how anyone arriving in this country is entitled to immediate welfare. When my generation and all previous generation arrived to these precious shores, we could not be a burden to the Nation. Either we had to provide evidence that we could take care of ourselves or have a Citizen vouch that he would assume full responsibility for us financially. What the hell happened to that rule?
5. Now that I have vented my spleen on you, thank you for being such wonderful and patient readers. But, why wouldn't you be? You are North American Aviation family!

— Ed Rusinek

A Mustang Goes Farther With A Little Polish

Reprinted from The Polish Air Force At War – The Official History – 1939-1943 *by Jerry Cynk*

RAF No. 309 (Polish) Army Cooperation Squadron was formed on 7 October 1940 at Renfrew, near Glasgow, to support the Polish troops training in Scotland. It was equipped with 12 Westland Lysanders, one Percival Proctor and two Tiger Moths. In April 1942, the squadron began to refit with North American P-51 Mustang I fighter-reconnaissance aircraft.

From the moment of his first flight in a Mustang on 30 April 1942, F/O (Lt.) Janusz Lewkowicz fell in love with the airplane and became fascinated with its capabilities. A graduate of the Warsaw Technical University, he approached the NAA representative in London and obtained an analysis of the Mustang's fuel consumption at most favorable boost pressure and airscrew-rotation speed settings for various altitudes and speeds.

Thinking about a most spectacular way of demonstrating the Mustang's range, he became captivated by the idea of a fighter sweep from Scotland to Norway. He started his own studies and produced petrol consumption/range calculations, graphs and navigational charts. These were put to practical tests during various exercises by the No. 309 pilots, which fully verified his theoretical calculations.

At the end of June, Lewkowicz forwarded his proposals for the Norway sweep, backed by the results of his research, to HQ No. 71 Group. There was no response. In a desperate attempt to prove the feasibility of his proposals, he decided to put them to the test without authorization.

His chance came on 27 September 1942 when he obtained permission for a long-range navigational flight over the North Sea from Dalcross (which was some 100 miles further from Norway than Peterhead, the most suitable airfield for such a sortie). He took off at 1005 hours, heading for Stavanger, Norway. One hundred miles from the Norwegian coast he dropped down to wave top level. He made a low-level sweep over Stavanger Bay and the town itself, strafing a few targets of opportunity. He intended to land at Peterhead, but veered off course and landed at Dunino at 1350 hours.

Meanwhile, there was consternation at Dalcross when he became "overdue". Checking the Operations Book, it was found that Lewkowicz had noted "Rhubarb to the Stavanger area". Upon landing, he was placed under house arrest, severely reprimanded and then congratulated. The range of Mustangs operational sorties was increased in October 1942.

In June 1943, No. 309 Squadron (Polish), fully equipped with Mustang Is, was transferred to No. 12 Group of Fighter Command.

Mr. Cynk is a noted writer, historian and authority on Polish Aviation. During World War II, he served in the Polish Underground until he was captured in 1943 and sent to Auschwitz Concentration Camp. He was moved to several other camps and was liberated in May 1945 near Salzburg, Austria. He moved to England, married and now resides there with his wife.



Photo from the NAARB Photo Files

A Mustang I, S/N RAF AG348, similar to the one flown by F/O (Lt.) Janusz Lewkowicz in his singular attack on the coast of Norway to demonstrate the extended range capability of the aircraft. All Polish aircraft in the RAF were distinguished by a small PAF red and white checkerboard insignia forward of the cockpit.

Contrails From The Past

by Ed Rusinek

Dear Ed,

Please accept the enclosed donation from my wife and I which we would like to go towards the NAA Memorial Bench at my alma mater, the United States Air Force Academy. The donation is made in memory of my grandfather, Robert K. "Bob" Weebe, NAA Loftsman, Lineman and Engineering Supervisor from 1937-1966. Also, in memory of his loving wife, my grandmother, Marie Weebe, whose support, encouragement, love and prayers for her husband served him well in the design of NAA aircraft.

— Lt. Col. Michael Gleichman,
USAFA Class of 1980
Louisville, KY.

Ed's Resp.: I can assure you Colonel that we are pursuing every avenue to get the Memorial Bench approved but we are stymied by the Academy lawyers because they view us as a private company trying to buy our way to some sort of business transaction.

Dear Mr. Rusinek,

Thank you for your thoughtfulness in sending me the stories about some of my WWII experiences that Jay Stout wrote for your bulletin. I apologize for my lateness in acknowledging their receipt. However, at my age, unplanned events happen beyond one's control. Jay is a fine individual whom I have been privileged to work with in the past.

Again, you are most kind to think of us "ole vets" when you prepare your bulletin.

— Col. Arthur C. Fiedler, USAF (Ret.)
Oxnard, CA

Ed's Resp.: It is we that should thank you, Colonel, in memory of the 41,802 USAAF airmen who were killed over the skies of Nazi-occupied Europe. It is you and your fellow P-51 Mustang pilots that saved countless B-17 and B-24 bomber crews of the 8th and 15th Air Forces by escorting them all the way to the targets and back to safety in Britain and Italy.

Congratulations and Best Wishes to

Dan and Maxine Hays of Rocklin, California
celebrating their 74th Wedding Anniversary

Frank and Reva Chudoba of Van Nuys, California
celebrating their 65th Wedding Anniversary

William and Barbara Mitchell of Long Beach, California
celebrating their 65th Wedding Anniversary

Eugene and Shirley Somers of Orange, California
celebrating their 65th Wedding Anniversary

I asked the Lord in heaven above,
to help me find someone to love.
A caring person, loyal and true...
He heard my prayer and sent me you.

The P-51 Mustang War Diary

June 15, 1944—Escorted by some 750 Mustangs and other fighters, which dive-bombed and strafed enemy military installations, more than 1,300 heavy bombers hammered German targets at Bordeaux, Nantes, La Poissoniere and La Frilliere. Bridges across the Loire River, essential to the movement of German troops from the south, were among the many targets.

Disregarding peril to themselves by staying in the air eight hours and two minutes, a length of time unprecedented for a fighter, four Mustang pilots formed a protective circle around a crippled bomber and safely brought it back to its base. To avoid flak, the course home took the planes out of sight of land for three hours. The distance the Mustangs flew was estimated at several hundred miles further than from London to Moscow.

The Silent Majority

by Stan Guzy



FULTON, FITZHUGH L., "FITZ", 89 – the revered military and NASA test pilot, known as the Dean of Flight Test passed away at home in Thousand Oaks, CA on February 4, 2015. He was one of America's most accomplished test pilots having flown more that 15,000 hours in over 225 different types of aircraft. He received his "pilot wings" in December 1944, too late for World War II combat. He flew 225 missions in the C-54 Skymaster during the Berlin Airlift. He logged 55 combat missions in the A-26 Invader in the Korean War. In 1952, he completed the USAF Experimental Test Pilot School at Edwards AFB. While Chief of the Bomber Flight Test Section, he set an international record for carrying a 5,000 kilogram payload to a height of 85,360 feet in a B-58. During the 1970s, he was the project pilot on the 747 Shuttle Carrier Aircraft used during the Space Shuttle Approach and Landing Tests releasing the Enterprise. Mr. Fulton was the consummate gentleman, always soft-spoken and polite. He will be missed.

ALTSHULER, ROBERT F., 79 – of Anaheim Hills, CA, passed away on January 9, 2015 after a long battle with heart disease. Bob's wife, Shirley, and family members were at his bedside. Bob joined Autonetics in 1959 and, subsequently, moved to Space Division, where he had a successful career as a contract administrator until he retired in 1990.

BLUMHAGEN, VERN A., 85 – passed away peacefully on October 27, 2014 at his home in Vida, OR. Graduating with honors from Iowa State with a B.S. in Electrical Engineering, he went to work at General Electric for four years before moving to California. Coming to Autonetics, he was responsible for a crew of over 40 engineers in developing guidance missile systems for missiles. He had a paper published by IEEE, which is still used as reference material in systems work. Bob retired in 1987 and is survived by his wife of 59 years, Marilynn.

BOWMAN, ELDON L., 92 – passed away in Simi Valley, CA on August 3, 2014. Eldon was an independent Research & Development engineer. He retired from the Tulsa Division in 1983 with 35 years of service.

CABLE, DONALD R. – of Fountain Valley, CA passed away on November 13, 2014. Don served at Space on the Apollo, Saturn and Shuttle programs. Assigned to the Orbiter GSE EGLSS, he made frequent trips to KSC where he was cheerfully referred to as "DR. CABLE". Don retired in 1996 with 35 years of service. He is survived by his loving wife of 46 years, Donna.

CAMPBELL, WILLIAM R., 77 – passed away peacefully at his home in Cypress, CA. Bill worked in Human Relations at various divisions of NAA/RI for thirty years before retiring. He spent the last years of his retirement as a volunteer at the Los Alamitos Medical Center. He is survived by his loving wife of 55 years, Rona.

ELTON, OLE L., "RED", 81 – of Rochert, MN, passed away on December 24, 2014. Ole retired from NAA after 30 years of service, including eight years on assignment in Washington, D.C. He moved to Minnesota and became an ordained Deacon of the Catholic Church. He is survived by his wife, Mary.

HARTMANN, EDWARD, 89 – died on November 1, 2014. Raised on the East coast, he moved to California and joined Autonetics, working on various projects related to aircraft design, radar, space, missiles and National Missile Defense programs. He retired from NAA/RI after 43 years of service and is survived by his wife of 54 years, Suzanne.

HEWITT, LUCILLE M., 87 – passed away in Vancouver, WA on September 4, 2014. She began her career in 1951 at S&IS, working in Material and Production Control. She served on the Apollo and Space Shuttle programs at Downey, Palmdale and, finally, at Seal Beach as Logistics Coordinator, Production Scheduler, Project Liaison Rep and as Document Closeout Coordinator. She retired in 1990 with 39 years of service. Lucille was interred at Fort Rosecrans National Cemetery in San Diego with her beloved husband Norman. He was also an NAA Retiree.

HOSKINS, HUGH T., 78 – died on December 4, 2014. Hugh graduated from USC in 1962 with an M.S. degree in Electrical Engineering. He programmed large IBM computing systems for NAA/RI, was a devout USC Trojan fan, and also programmed the card stunts for the USC football games. He retired from NAA/RI Space Division after 40 years of service. He is survived by his wife of 47 years, Arliss.

MARGHEIM, DONALD M., 79 – went to be with the Lord on October 28, 2014. Born and raised in Nebraska, he was QB for the University of Nebraska football team; he moved to San Diego, CA and served a short time in the U.S. Navy. He then joined NAA/RI where he worked on the XB-70, Apollo, B-1 bomber, and Space Shuttle programs. He retired from aerospace after 30 years of service and is survived by his wife of over 30 years, Nellie.

MATHEWS, JOHN M., "MIKE", 77 – of Palm Desert, CA, was taken by the Lord on December 30, 2014. Mike had worked for more than 30 years at several aerospace companies, including NAA/RI and Boeing. He served as Director of Communications for NAA/RI Aircraft Operations on the AC-130U Gunship, X-31A EFM and the B-1B Lancer programs and, subsequently, at Boeing on the C-17 Globemaster III program until retirement in 2000. Mike is survived by his loving wife of 38 years, Paddy.

McLAUGHLIN, JAMES F., 91 – of Nipomo, CA., died on April 18, 2014. Jim was an engineer at Space Division on the Apollo and transferred to Vandenberg AFB. He retired in 1983 with 30 years of service.

McQUADE, KENNETH F., 81 – died in the arms of his wife Ann on September 30, 2014 during recovery from a massive stroke. Ken immigrated in 1956 from England to Canada with his wife and daughter to work for Canadair. He then moved to California and joined Autonetics where his digital avionics expertise was focused on the F-111 program.

When NAA won the Space Shuttle contract he was chosen as VP of Shuttle Avionics and then as Chief Engineer of the Shuttle Program. He made rapid progression to Program Management and then General Management in the Collins Communication operations of NAA/RI. Ken's career spanned many years of the "golden age of modern aerospace". He was a modest, intelligent man, with an engaging personality that attracted and inspired the best talent to collectively solve heretofore-intractable problems.

NELSON, LYLE, 90 – died in Sun City, CA on November 20, 2014. Lyle joined LAD in 1955 and was assigned to the Mass Properties Group. He worked on the F-107A, T-39A, F-100D ZELL, X-15 and XB-70A. He transferred to Advanced Design where he programmed the first desktop computers.

NORWOOD, LELAND "LEE", 94 – of Palos Verdes, CA passed away on February 7, 2015. Lee joined LAD in1937 and worked as an engineer on many projects including the P-51. He was widowed by his lovely wife Margaret in 2002. He was President of the Rockwell Camping Club and enjoyed the camaraderie of many NAA retirees.

OSBORN, WARREN L., 86 – died on January 29, 2015, surrounded by his family. Born in Wyoming, he served in the U.S. Marines and received an Aero Engineering degree from the University of Colorado. He was assigned to various projects at LAD and Autonetics. Warren retired from the Space Division in Downey, CA after 35 years of service. He is survived by his wife of 62 years, Dixie.

SLATER, GORDON L., 89 – of Mission Viejo, CA passed away on January 29, 2015. Gordon served in the Army during WWII and survived as a POW in Stalag 12-A. Returning to civilian life, he joined NAA/RI as an accountant and soon discovered that his contract negotiations talent to be his destiny. He was to succeed in that capacity for 30 plus years until his retirement in 1987. He is survived by his lifelong companion, Myrna Bisson, and an extended family of nieces and nephews.

WILSON, JAMES M., "JIM", 85 – of Nipomo, CA died on January 20, 2015. He joined NAA in 1962 after service with the Army in Korea. He retired from Space Division in 1988 where he served in the Engineering Project Office on the Galileo/Jupiter projects. He is survived by his wife of 64 years, Margaret.

WINDES, GEORGE I., 74 – passed away as a result of cardiac arrest on December 2, 2014. George held various positions and high-level security clearances on different projects he was assigned to at NAA. He was proud of the work he did when he retired at 68 with 43 years of service. He had been married for 20 years to Vicki Phillips.

YANOSCHAK, MICHAEL G., 74 – passed on peacefully on January 11, 2015 at home in Laguna Hills, CA. Mike moved to California in the early 1960s with his new wife Jo Ann. They quickly landed jobs at Autonetics where he worked as an Engineering Project Manager for more than 30 years. After retiring from NAA/RI he enjoyed gardening and working with computers.



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NORTH AMERICAN AVIATION
RETIREES BULLETIN
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Seal Beach, CA 90740

North American Aviation Retirees Bulletin
"Where The Best Never Rest"

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The Boeing Company archives via Mike Lombardi.

In Summer 1941, Dutch Kindelberger welcomed the Army Air Corps to the NAA Field Services opening of a contract factory school at the Inglewood facility, designated as the 3716 Army Air Force Base Unit. The courses were focused on either the B-25 Mitchell bomber or the P-51 Mustang fighter. The curriculum was structured to provide 28 days of training over five weeks, six days per week. The 525 soldiers in each class were split into three shifts. The phases of training, each lasting one week were: Airplane - General, Hydraulics, Electrical, Power Plant, Engine Change Out and Run-Up. By the end of 1944, over 13,500 young Americans had been converted from awkward teenagers into qualified crew chiefs and mechanics, trusted partners of the flight crews they supported.

North American Aviation Retirees Bulletin

"Where The Best Never Rest"

Summer 2015



Cadet First Class Sarah Folse
Outstanding Cadet in Aerodynamics

Cadet First Class David Horney
Outstanding Achievement for Excellence in Basic Research

Cadet First Class Ayesha Hein
Outstanding Cadet in Astronautics

Cadet Candidate Richard Evans
Outstanding Cadet Candidate

NORTH AMERICAN AVIATION
Retirees Bulletin

North American Aviation Retirees Bulletin, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAA Retirees Bulletin can be contacted at The Boeing Company, Seal Beach facility by phone at (562) 797-3836. Send mail to:

North American Aviation Retirees Bulletin
P. O. Box 3797
Seal Beach, CA 90740

NAA RETIREES BULLETIN VOLUNTEERS
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Dear NAA Retirees Bulletin Subscriber

We begin the second half of the year with some good news and some bad news. Our efforts to provide a North American Aviation Memorial Bench for the Air Force Academy has been greeted with disapproving SILENCE from the Academy!

We thought that the Bench would provide inspiration for our future Warriors of the Sky and Space! So far, all we have drawn is the disdain of the campus art panel concerned about the purity of the campus grounds! But, do not lose hope! These poor souls are too young to remember that period of time when our Nation was plunged into the greatest war in history armed with wooden rifles and cardboard "tanks" and we had to sacrifice a lot of good men and women until the Nation could provide the weapons adequate to beat back the foe.

They are not aware that when the idea to bomb Japan after Pearl Harbor arose, it was **only** the North American B-25 Mitchell bomber that could be loaded on and launched from the aircraft carrier *USS Hornet* and then complete the mission! When our B-17s and B-24s were being used by the Luftwaffe for target practice over the skies of Axis-Occupied Europe, it was **only** the North American P-51 Mustang fighter that could escort the bombers all the way to target and back to base. Over Korea, when the Communist MiG-15 dominated the skies over South Korea, it was **only** the North American F-86 Sabre jet fighter that could best this lethal enemy! When the Russians launched Sputnik and we listened to it "bleep" overhead every 80 minutes while our satellites blew up on the pad, it was **only** North American that delivered our Astronauts to the Moon and back home! I know, I know! All that was done in the past. What have you done for us lately?

The folks at the Boeing History Office have opened their hearts and provided us access to the huge accumulation of NAA historical data plus a very enthusiastic volunteer in John Fredrickson to help us. This is a fantastic resource of North American Aviation history which we have been hoping to find for the past fifteen years of our independent existence!

The Bald Eagles yearly luncheon was a huge success with the outstanding speaker, Astronaut Jerry Ross; the splendid food served by the Golden Sails Hotel; and the charming décor organized by Sharon Simonsen, Cathy Baker and their committee of volunteers.

Our articles in this issue range in time from the sad days of the Great Depression to the graduation ceremonies at the United States Air Force Academy held last month. First, we have a beautiful report by William Smith, one of the original Bald Eagles, of the early struggles in Dundalk, Maryland to keep the Company alive! Second, this is followed by a heart building report by a very good friend of the Bulletin, modest Apollo 7 Astronaut Walt Cunningham, reflecting on the thousands of workers that sacrificed so much time and energy to assure the crew safety and the success of the Apollo Program. Finally, Boeing Historian, Mike Lombardi, tells of the actions he and his staff of volunteers are taking to preserve the history of North American Aviation.

For the sixth year, we presented the North American Aviation Outstanding Achievement Awards to the two graduating Senior Cadets in Aeronautics, one in Astronautics, and the Outstanding Graduating Cadet Candidate from the Prep School. Our good friend, Lt. Col. John Swanson, U.S. Army, Ret., represented North American Aviation in all three presentations.

For the fourth year, we again sponsored a technical speaker to address the students in the Aero and Astro schools. This year our speaker was Dr. Daniel P. Raymer. His coming created a bit of excitement because his textbook on aircraft structures is a standard textbook at the school. His visit was somewhat marred and curtailed because the area was hit by a huge two day snowstorm.

At press time we were suddenly saddened by the news of the passing of Dale Myers, one of the bright stars that led North American Aviation after World War II. Also, please continue to remember our ailing Sunny Robertson, Stan Guzy and Nolan Leatherman in your prayers. Sincere prayers are never wasted!

North American Aviation at the USAF Academy in 2015

For the sixth year North American Aviation has been active at the United States Air Force Academy under somewhat daunting conditions. With the school year racing towards graduation, we promised to provide a technical speaker as we have done in the past five years. However, this is not an easy task because he must be well versed in the technology of today and prepared to make his presentation to a group of sophisticated engineering seniors. Through a mutual friend we discovered Dr. Daniel Raymar. He is an NAA veteran who currently conducts lectures on Aerospace subjects. When we informed the Academy of his coming, the faculty was elated because his textbook on design of aircraft/spacecraft is a standard reference at the Academy. Unfortunately, his two-day visit was hampered by a heavy snowfall that closed the campus for several hours, but he did meet with several classes and the faculties.

Since the Prep School graduation ceremony was scheduled a week prior to the Academy graduation ceremony, we asked our good friend, Lt. Col. John Swanson, U.S. Army, Ret., to represent North American Aviation at the Prep School graduation to present the NAA Outstanding Achievement Award to the Cadet Candidate as recognized by the faculty. That ceremony was accomplished without a hitch. For the graduation presentations to be made at the Astronautics and Aeronautics ceremonies, we asked Paul Hirsh to do the honors. He was pleased to accept the task. However, two days before departure for Colorado Springs, his wife sustained a serious injury and he had to cancel his trip. With only two days before the ceremonies, we again asked John Swanson to do the honors. Although he was tied up in a very serious business negotiation, he recognized the desperation in my voice and agreed to be there for us! A friend when in need is a friend indeed!



Photo courtesy of Lt. Col. Shad Reed, USAF

Col. Neal Barlow, Department of Aeronautics Head, presents a certificate of appreciation to Dr. Daniel Raymer for his visit and lecture to the cadets.



On behalf of the North American Aviation Retirees, NAA Retirees representative Lt. Col. John Swanson presents the NAA Outstanding Cadet in Aerodynamics Award to Cadet First Class Sarah A. Folse.



Cadet First Class David C. Horney of Reno, NV receives the NAA Outstanding Achievement Award for Excellence in Basic Research from NAA Retirees representative Lt. Col. John Swanson.



Cadet First Class Ayesha Hein from Honolulu, Hawaii receives the NAA Outstanding Cadet in Astronautics Award from NAA Retirees representative Lt. Col. John Swanson, being assisted by Astronautics Department Head, Col. Martin France.



Col. Gerald Szybist, Commander of the USAF Academy Preparatory School congratulates Cadet Candidate Richard Evans, having received the NAA Outstanding Cadet Candidate Award from NAA Retirees representative Lt. Col. John Swanson.



Photo courtesy of Lt. Col. Kurt Rouser, USAF

NAA Technical Speaker, Dr. Daniel Raymer, addresses the Pikes Peak Alumni Chapter of the Tau Beta Pi National Honor Society during an evening meeting held at Uncle Buck's Fishbowl and Grill in Colorado Springs.

"…our future readiness will depend in part on our ability to successfully draw the best talent from every sector of society and every corner of this nation."

"I charge you to lead us into the future with a more diverse and inclusive workforce and to help foster an environment and culture of dignity and respect, and …to care for the men and women under your command as well as their families."

— Deborah Lee James
Secretary of the Air Force
Address to the U.S. Air Force Academy
Class of 2015

Dundalk Memories – Early Beginnings

by William B. Smith

Editor's Note: The following report was written by Bill Smith, the retired Apollo Production Manager, in the form of a letter in 1991. Years later, a copy was forwarded to the Bulletin for possible publication. It was promptly filed for safe keeping and was not resuscitated until this year when it was discovered in a search for another article. Like the raising of Lazarus, it is a discovery of biblical proportion!

At the beginning, in the Dundalk, Maryland scene, the nucleus of people experienced in the new field of Aviation was extremely small. However, there seemed to be a gravitation to this place on the Chesapeake Bay from the few sources of experienced people available. They came from the old Tony Fokker Company and from Glenn Martin, Fairchild, Curtiss Wright and from some even much smaller companies as well.

Dundalk was a small mill town founded by the Shipping Board, a government agency, to house employees needed to produce ships for World War I. Many of these craftsmen came from Scotland and Ireland. Hence, the name Dundalk came from a similar ship building town in Scotland. Many of the street names still have the marine connotation such as Leeway, Portship, Admiral, Flagship and Eastship.

During the 1930s, the Great Depression was on! The steel mills built by the Bethlehem Steel Company after the Great War, were nearly shut down and the work force was barely surviving. Certainly, some great successes were accomplished by our early aviation pioneers such as Charles Lindbergh's solo flight to Paris. Speed and endurance records were constantly challenged and beaten. My father introduced me, as a boy, to Jimmy Doolittle at the Schneider Trophy Race held back in 1925 at Chesapeake Bay in Baltimore.

Jimmy Doolittle was the winner that year and we thought the planes were flying at tremendous speeds. Actually, they were flying at speeds between 280 and 300 miles per hour!

This area seemed to have become the hub of aviation interest on the East Coast. I think it was because of the openness of the area and all the water available for the takeoffs and landings of seaplanes. Indeed, some of the boldest designs were for seaplane concepts. Dundalk was also of interest to the early aircraft companies because of its short distance of forty miles to Washington, D.C. and its Congressional influences.

Aviation at that time was just starting to emerge as an answer to the doldrums of the Depression. Everybody seemed to think of aviation as an adventure and a new romantic antidote to the financial and morale problems of the Nation.

There were very few who really foresaw the real future of aviation. Billy Mitchell had to sink a battleship from the air to prove the potential of air power. Dutch Kindelberger who not only foresaw the expanding use of the airplane but sensed another war in the near future and wanted to be prepared for it!

I remember in the early 1930s visiting an Italian Savoia-Marchetti airplane that had just landed on the grass runway at Logan Field, the field which the early North American Company used. The airplane was designed so that the fuselage acted as an airfoil. I happened to be in the airplane as a curious kid when Dutch came in alone, looked around, and said to me, *"I have a better idea!"* As Chief Engineer at Douglas, Dutch had just completed the design of the famous DC-1. His better idea was the low cantilever wing with no external bracing. This concept proved to be the foundation of our company's future designs and products. It led to the design and building of the first pure North American Aviation product, the BT-9 which evolved into the famous AT-6 basic trainer.

During this period, several predecessor companies struggled to stay alive. One was the Berliner Joyce Aircraft Company which evolved into the General Aviation Company, a holding company of Eastern Airlines. About this time, new management took over and it became North American Aviation, Inc.



The Berliner-Joyce Aircraft Company became the first North American Aviation facility located in Dundalk.



Although Seversky already won the design competition and had received a contract for thirty BT-8s, Kindelberger offered to design and build a superior airplane in just ninety days. His "gang" performed the impossible and the prototype airplane, the NAA NA-16, with open cockpit and fixed landing gear was flown to Dayton. The Army Air Corps requested a closed canopy and landing gear fairings which resulted in a contract for thirty-two BT-9s, followed by an additional forty BT-9As. This was all the incentive needed for Dutch to move the company to California!

headed by Dutch Kindelberger. Kindelberger had just come over from the West Coast where he was Chief Engineer for the Douglas Aircraft Company in Santa Monica, California.

On his first visit through the plant, Dutch saw a lot of residue from earlier attempts to capture any kind of government contract. Some of this hardware included a Navy fighter and an Army observation aircraft. There were even pontoons resulting from a subcontract from the Curtiss Wright Corporation. Kindelberger was not impressed with what he saw and he made no bones about saying that he didn't like any of what he saw. It did not improve his disposition when he heard talk that he left as Captain of the Queen Mary (Douglas) to become "Skipper of a fishing smack (North American)".

During this time frame, the competition for airplane contracts or any other kind of business was severe. The new company was very thinly staffed. Dutch Kindelberger was the Sales Manager and filled any other position the company could not afford. Mrs. Kindelberger was called in many times for help and was especially useful as an interpreter in negotiating South American and Spanish business. This Spartan existence was not confined to the front office. The company could not afford a test pilot, and I can remember that one of the shop mechanics flew the first BT-9 to Dayton, Ohio for the Competition Evaluation!

About that Competition! Dutch Kindelberger had an unusual relationship with General Hap Arnold. Having dinner one evening at the Mayflower Hotel in Washington, D.C., Dutch was pursuing his quest for any kind of airplane business. General Arnold made it very clear that the competition for the a new Army Air Corps Basic Trainer contract was well along and Dutch's new company simply could not design, build a prototype airplane and deliver it to Dayton in the 26 weeks still remaining! Apparently, Dutch hastily scribbled the basic specifications and his concept of this airplane on a cocktail napkin. This was the beginning of the great team spirit that Dutch was so proud of. He was a great motivator and it did not take him long to organize his "gang" as he called us.

Men like Lee Atwood and Stan Smithson headed the Engineering Department. Harold Raynor was in charge of Weights and Balance, Larry Waite for Aerodynamics, Edgar Schmued for Basic Design, and Dick Slicker for Stress Analysis. They were all the best professionals of their time as they later proved by designing the best airplanes in the world. Others came on line, such as Noble Shropshire, who put together the Company's first Contracts Administration, and Frederick "Smitty" Schmitt, who was a whiz at Estimating and Pricing.

All this Engineering was backed by a small, but very effective Manufacturing Group; comprised of experienced sheet metal



Boeing Archives photo courtesy of John Fredrickson

Dutch Kindleberger (front row, second from right) and Lee Atwood (front row, left) with the Dundalk "gang".

workers from Friedrichshafen, Germany, headed by Richard Seigfried. Other German, Scottish and Swedish craftsmen formed the backbone of the new company's tool design, tool manufacturing, welding, machine shops and other operations. In their midst stood a tall Swede, Ralph Ruud.

Some of the skills required in those days were very hard to replace, such as power hammer operators. The very few men experienced in this means of forming metal got their share of pampering. One of the most talented of these men was Cleo Arnheim, who pushed the patience of our factory manager to the limits over the accuracy of his rivet blowgun.

There was a lot of camaraderie and cohesion in our gang which fused together all the operations. There was no such thing as an isolated Engineering Department. Engineers spent most of their time in the shop, working out producible designs that could be manufactured with the limited tooling and equipment available.

I cannot say enough for the integrity and spirit of this early North American Aviation team and its management! Everybody felt that they really belonged to this new family. An incident occurred one night that sums it all up better than any other way I could describe it.

Dutch Kindelberger had returned to the factory at 11:00 p.m. and found the lights on, machines humming and the day shift still working. The gang was trying to complete the first BT-9 prototype trainer and deliver it to Dayton in the few weeks still remaining before the competition began. He summoned the factory manager, Bob McCullock, and scolded him about jeopardizing his new company by working the men overtime. (This was the Depression Era and the Government's new NRA rules forbid working employees longer than forty hours.) He was led to the time card rack and shown that the day shift had punched out at the regular time, went across the street to the local watering-hole, had a sandwich and a glass of beer and returned to continue working. Not a soul had punched in or was being paid overtime. As it was explained to him, *"Dutch! We finished working, we punched out, we went and had a sandwich and now we come back to socialize a little!"* How can you possibly lose with a team like that?

This report could not be complete without some mention about that gang's favorite watering-hole, "Helen's Saloon and Restaurant", located directly across the street from the first company factory building. "Helen's" was the stage for crab cakes, beer, bookie bets and some corporate office business. Many early decisions were made here and many ruckus beer sessions were enjoyed here by most of the gang. Dutch and his management team were also well represented at Helen's and there was little differential between them and the shop people!

Few of the original Bald Eagles survived the airplane business as we knew it then and adapted smoothly to the requirements of the Space Age. However, this Bald Eagle was part of the Moon Landing program from beginning to end and I can truly say that it has been one unforgettable journey since we were handed $75.00 and a road map from Dundalk, Maryland to Inglewood, California more than fifty years ago.

Editor's Note: Think of this Moment as Your Moment! It is the middle of the Great Depression! You and less than 100 other men have just won a contract to build some airplanes that haven't been fully tested but represent your best effort. The Boss, Dutch, shows up at your house with a few bottles of beer and talks to you about packing up your family in your tired old car and moving 3,000 miles away to build those airplanes in a place called California. Once he leaves to start over in California there is nothing here in Dundalk! The Boss has very limited funding for this enterprise. For gas and food money, he has scraped together a $75.00 check for each family going. What would be your decision?

We Got the Glory, But Our 400,000 Member Team Was Responsible For The Success

by Walter Cunningham

The older I get the more I appreciate having played a small role in one of history's greatest accomplishments. I would like to share what it was like to be part of the Apollo team and to live and work giving birth to the Apollo spacecraft.

With the Apollo Program, America took the historical role of opening the next frontier. As astronauts, we were at the tip of the spear and we got the glory but the success of the program was due to the collective efforts of 400,000 members of the Apollo team-engineers, operators, managers and contractors. With the whole world watching, America accepted the challenge, took the risk and changed the way we perceived our world.

Exploring the next frontier by landing on the Moon, a world untouched by humans, was a daunting and thrilling challenge. Working for NASA to test and fly a new spacecraft was a different experience from flying a new fighter aircraft, which was also a thrilling challenge. Checking into a new Marine Corps fighter squadron with new aircraft sitting on the flight line, required a couple of days of briefings and then out to the flight line to check out in the new airplane.

In NASA's "good old days", we were involved in the development and testing of the spacecraft for years before we would finally get the opportunity to lift off into space and fly it. At North American, our Apollo 7 crew worked with the Contractor at the design level, the Critical Design Reviews and testing of both the Block I and Block II Apollo Command Modules.

Those days were more like the way test pilots are currently involved with Boeing and others to develop a new airplane today. From the beginning, the test pilot is part of the design team. He is looking at it from the operational, reliability and safety aspects and provides those inputs to the design team. Pilots are involved in the testing long before the first flight, and they stay involved until the aircraft is ready to fly.

In our drive to beat the Russians to the Moon, traditional schedules were replaced by the hectic pace of "Go Fever." That hectic time was hard on the workers at North American, Grumman, Boeing, Chrysler and many other contractors. Those working to get us off the planet Earth and into orbit were generally young. The average age of the engineers working on the program was 28.

Everyone was focused on the mission and work was often 24 hours a day, seven days a week, especially at the Grumman plant. Our Apollo crews worked with the contractor's engineers and management on design reviews, installation and testing at the factories. Given the experimental nature of what they were attempting in the design stage, actions were rarely taken just once. Engineers would install the systems and we would help with the testing.

By early 1966, our early Apollo crews were heavily involved with the engineers and developers of the Command Modules at North American. The spacecraft was in the development stage and I practically lived at the Space Division in Downey, California. During this time, I recall being on the road and away from home one year for 275 days. The only way we could get any cockpit time in the spacecraft was to work with engineers and manufacturers while they were installing and checking out many spacecraft systems.



NASA photo

Astronaut Walter Cunningham

At North American, while constructing our Command Module, there were many development problems. Working with the engineers, day and night, we had them add a little bunk room above the floor where our spacecraft was being constructed. We had four bunks but most of the nights only two of us were on duty. Most of the night testing was done by Frank Borman and me. (Perhaps, because we didn't have as exciting a night life in Los Angeles as some of our crewmates.)

We would sleep or study in the bunk room until receiving a call that they were ready for a test. We'd go downstairs, do the testing and then return to catch some sleep.

Many times there was trouble during a test and we would not know how long the delay would last. If I thought I could contribute, I would join the test team in reviewing what must be done to troubleshoot the issue. If I didn't have anything to add to the equation, I would return to the bunk room and grab some sleep until the engineers called us back.

There was not much downtime when assisting in the testing process. If we had a break, we tried to make the most of it by taking a nap to catch up on sleep. Some of the early tests on various systems could run for hours and, occasionally, for days. The level of development problems led to schedule slippage which triggered the development of the "Block 2" spacecraft.

What I recall more than anything else about those times is that, regardless of whether we were working at NASA with our crew support team or with the contractors, every engineer "owned" the program. What they were doing was as important to them as my work to fly the spacecraft was to me.

In those days, landing a man on the Moon was viewed by much of the public as an impossible goal. The workers' dedication, however, to accomplishing the impossible was nothing short of extraordinary. They were all going to do the best job they could to make sure that our mission was safe. To this day, they each refer to it as "their program".

That was the kind of commitment and dedication the workers had and what we admired most.

Today, a half-century later, our manned space program has evolved greatly.

I visited the Space X facility two years ago and found it to be quite an impressive layout. It was one building with clean floors and not crowded with workers. The spacecraft was being assembled on the floor and you could move it over into one of the corners for testing. It was very efficient for constructing the new machine but there was little or no flight crew involvement, like there was when we were developing the Apollo hardware. And, while we did not always prevail in spacecraft design decisions, we were free to express our opinion and provide the operational experience the engineers were looking for while developing their hardware.

Our space program evolved out of the aircraft development and test world and a good number of the team came from that environment. The engineers had their area of expertise and we had ours at a time when operational experience was quite important. Today, when astronauts show up, they had better be able to learn what has already been designed, built and tested because it is virtually impossible for them to make any changes in the design or operation of the spacecraft.

Joining Boeing today when they are developing a new fighter jet or airliner has not changed much but there are fewer people involved. Apollo was a much larger program with many more components. Apollo wasn't just developing one vehicle but I think the approach was quite similar.

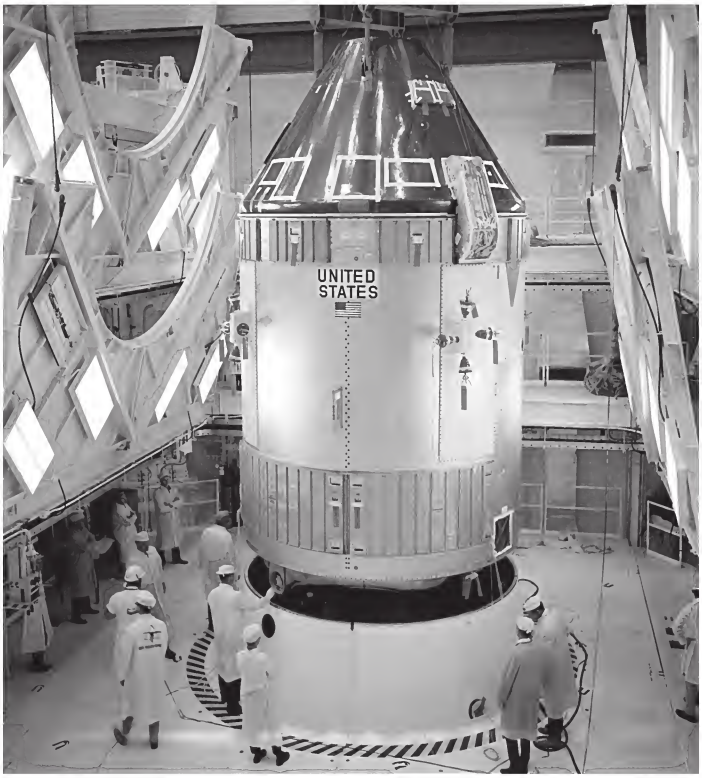
There were a minimum number of arguments with the lunar module. If there was a "fight", our folks would reach out to Bob Smyth, the Grumman test pilot heavily involved in the lunar module development, and he would make sure that we got it right.

North American operations was not quite as smooth as it was at Grumman. North American had psychologists involved in the "human engineering" but they could not provide operational experience. One time the head of Rockwell complained to Bob Gilruth, the Director of our Manned Spacecraft Center, that, *"The program was okay and on schedule until you got the astronauts involved. Now, everything is slipping."* Gilruth told him, *"That's okay, we're not charging you for their time."*

There was also a spread in the age of the engineers working on the design team. While principal engineers had 15 plus years of engineering experience, the team ranged all the way down to those fresh out of college. Normally, you might not expect a new engineer to do well but space exploration was a brand new field and young engineers were quite competitive. In Mission Control during Apollo, the average age of the operators was 28. These young professionals also felt like they owned their jobs and that was a major contribution to why we were successful. The key to success in those days was the total dedication and cohesion of the designers, engineers, manufacturing personnel, test engineers, field operation and test site personnel, and Mission Control teams. Management was probably even more important. NASA managers were willing and able to make the tough decisions—and then live with the consequences—the good and the bad. Contractor personnel were willing to do whatever necessary to make the program a success. That is why the 400,000 member team deserves the credit for Apollo.

Today, the public seems to have gotten away from the challenge of attempting the impossible and solving whatever problem is encountered, regardless of how difficult it may appear. We need to return to that environment where our team, at all levels, contributed to success by freely expressing their candid opinions on design, testing, operations and management issues. If we can return to that attitude, we will once more share the same thought: *If this mission fails, it won't fail because of me!*

About the Author: Astronaut Walt Cunningham has enjoyed multiple careers in the United States Marine Corps, with NASA and in private industry. In 1967, he was a member of the prime crew for Apollo 2. When that was cancelled, he was assigned to the backup crew for Apollo 1. With the loss of the prime crew in the fire on the pad, he was assigned to the first manned flight of the Apollo Program – Apollo 7. At the time, Apollo 7 was the longest, most ambitious and most successful test flight of any new flying machine – ever. Following the Apollo 7 mission, he served as Chief of the Skylab Astronauts. A retired Marine Corps fighter pilot with the rank of Colonel and 4,500 hours pilot time, Walt is a successful businessman, entrepreneur, venture capitalist, lecturer, radio show host of "Liftoff to Logic" *and author of* "The All-American Boys" *about the golden age of manned space flight.*



NASA photo

Apollo Spacecraft 101 Command/Service Modules being moved into position for mating with Spacecraft Lunar Module Adapter by North American Aviation and NASA personnel in the Kennedy Space Center's Manned Spacecraft Operations Building. Spacecraft 101 was flown on the first manned Apollo space mission, Apollo 7.

Boeing Archiving History of North American Aviation

by John Fredrickson

Since December 6, 1996, when Boeing purchased North American Aviation from Rockwell International, much effort has been expended to gather, preserve, and protect the fascinating history of North American Aviation, Inc. (NAA). This is a brief overview of the Boeing Historical Archive with emphasis on the status of the North American collection.

Starting in the 1980s, Boeing built an office-complex adjacent to the site of an abandoned general-aviation airfield in the Seattle suburb of Bellevue to house the headquarters for the Information Technology (IT) branch of the company, named Boeing Computer Services (BCS) back then. A dozen or so three-story black buildings were sprinkled amid the tall fir trees. The move, however, never came about.

A special building, Number 33-05, was designated to house electronics manufacturing and a major data-processing center. The basement was built as a concrete-bowl so there would never be a chemical spill – even after the worst of earthquakes. Again, Boeing never utilized the Bellevue site for manufacturing. Hence, the Historical Archive moved into 18,000 square feet of the underground concrete bunker in 1990 and it took a fleet of semi-trucks hauling for weeks to move the collection.

Bellevue is the only Boeing repository in the Puget Sound area. It is augmented by additional archives in St. Louis for McDonnell Aircraft records and Southern California for Douglas Aircraft Company items. Over the years after 1996, the North American collection has been incrementally moved from various Southern California record storage warehouses to Bellevue. Corporate Historian at Boeing, Michael Lombardi, is augmented by three other full-time employees. The Historical Archives office also relies upon a small but dedicated crew of volunteers, most of whom are retired Boeing workers with varied backgrounds but a common shared passion for aviation history.

The North American collection would easily fill three semi-trailer trucks. It consists of photographic still negatives, prints, motion pictures, video and many forms of written documents. Photographic images on film are stored in a massive temperature and humidity controlled vault to prolong preservation.

The photographs arrive in their original record-storage cartons. Each carton is opened and inventoried. Negatives are put into new sleeves, if needed, and information is transcribed from the old sleeve to the new. The negatives are put into special archival boxes which vary in size depending on the



Boeing photo courtesy of John Fredrickson

Surrounded by historic airplane models and original paintings, cartons of North American Aviation photographs await processing at the Boeing Historical Archive nestled amid tall fir trees in the Seattle suburb of Bellevue. The images, most often many decades old, will be inventoried, repackaged, organized, and placed into a climate-controlled film vault for long term preservation.



Boeing photo courtesy of John Fredrickson

film. Most images are 4x5, with some 8x10. Color and 35mm photographs became more common after World War II.

I have been working to better organize the still-photos for four years. Other work is accomplished on documents and artifacts. The project was begun from the middle with triage applied. The first cut was to sort-out and process World War II Era photographs. They were segregated from older pre-war and newer post-war images. Nearly all have since been further organized into two general categories: Production and overhead. The original numbering schemes have been honored. A photograph with a number is easy to organize. Unnumbered photographs are a headache. The significant of the unnumbered photographs have had (or will have) a number assigned.

The collection has further been organized by location and era. The Kansas City wartime "overhead" images are now sorted by original number and stored together. Other site collections include Inglewood, Fresno, Palmdale, and Columbus. Unfortunately, very few images of the Dallas plant remain. It is not known if they went to a landfill, or found a home in a Texas repository. In many instances, to save storage space, the prints were discarded. Those prints which remain are placed in ring-binders which are stored on shelves in the Archive. The oldest images are of Fokker Aircraft Company (Atlantic Aircraft Corporation) and the Berliner-Joyce Company. Some Fokker negatives are glass-plate dating back to the 1920s.

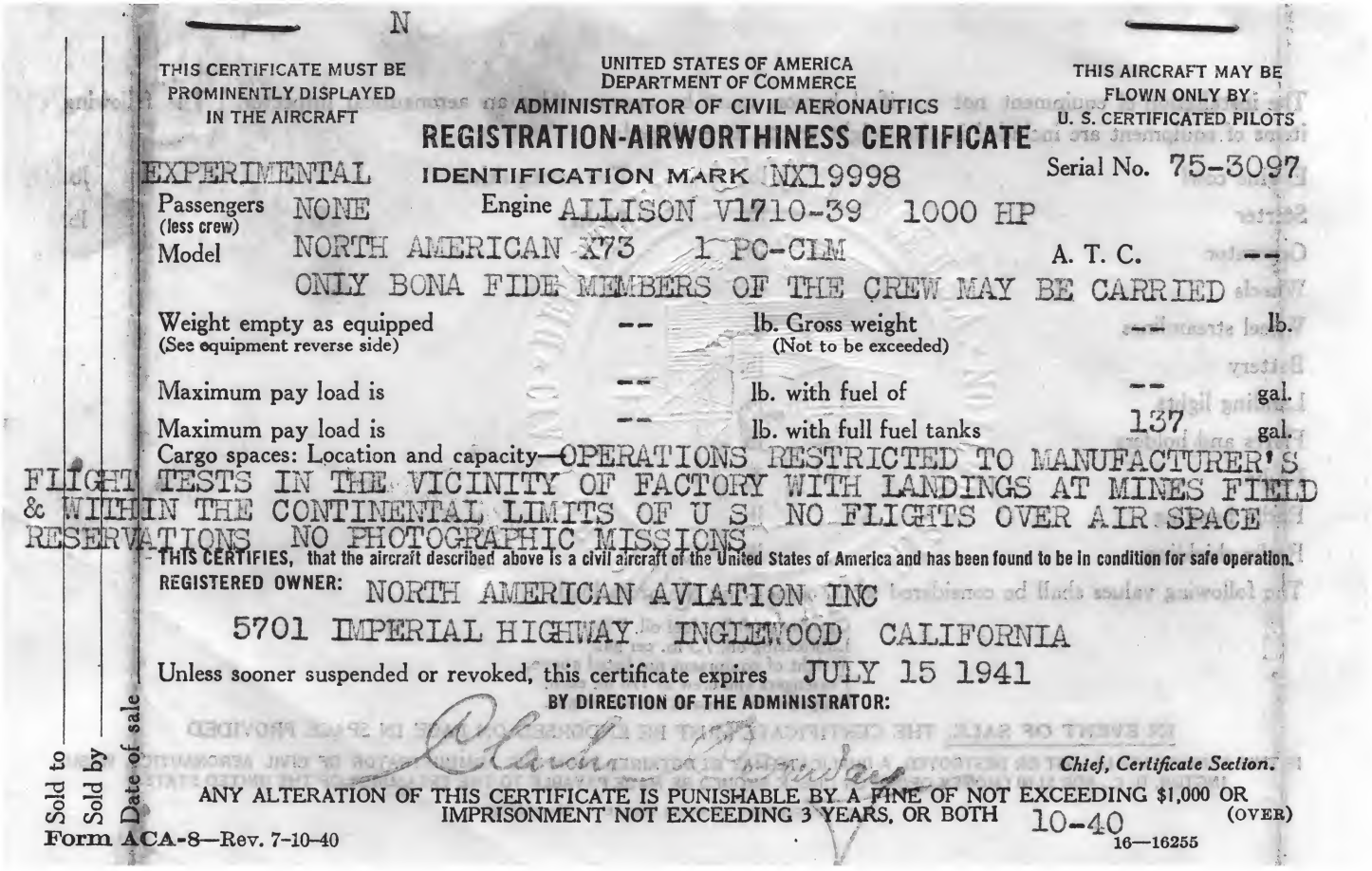
The preferred practice is to scan an image from the original negative when a publication quality photograph is needed. The Archive uses an Epson 750 scanner to obtain professional quality results. Prints or copy negatives can also be scanned, but the results are inferior.

Reams and reams of documents are also found in the collection that includes everything from personnel folders, countless engineering reports, stacks of accounting ledgers, and general business correspondence. Many of the older records relate to Eastern Airlines, a part of North American Aviation until divested in 1938.

Extensive photographic files are available on some of the newer projects including transonic wind tunnel, X-10 and Navajo, X-15, XB-70, Space Projects, and B-1A. I am currently working on the Columbus collection and it spans the period 1951 until about 1970. The interesting airplanes include many Navy aircraft ranging from the FJ series (similar to an F-86 Sabre), the T-2 Buckeye trainer, the A3J and A-5 Vigilantes, and the OV-10 Bronco of the Vietnam War-era.

An interesting historical document was encountered in December 2014. It is the original airworthiness certificate for the NA-73X, the prototype which evolved into the P-51 Mustang. At the time, the Mustang was conceived to meet the needs of the British and French. As such, the prototype flew under civilian certification. Each civil aircraft is required to carry and prominently display a government-issued Registration-Airworthiness Certificate. It is an essential document, somewhat analogous to a motor vehicle registration form.

The actual Airworthiness Certificate for the P-51 prototype, NA-73X, was found safely tucked away in the North American files on December 9, 2014. This small, but important, scrap of paper was carried aboard the iconic Mustang's pre-cursor during the entire flight test program – including when pilot Paul Balfour crash-landed the airplane in a freshly plowed bean field – thus bringing its fifth flight to an inglorious ending on November 20, 1940.



N

THIS CERTIFICATE MUST BE PROMINENTLY DISPLAYED IN THE AIRCRAFT

UNITED STATES OF AMERICA
DEPARTMENT OF COMMERCE
ADMINISTRATOR OF CIVIL AERONAUTICS

THIS AIRCRAFT MAY BE FLOWN ONLY BY U. S. CERTIFICATED PILOTS

REGISTRATION-AIRWORTHINESS CERTIFICATE

EXPERIMENTAL IDENTIFICATION MARK NX19998 Serial No. 75-3097

Passengers (less crew) NONE Engine ALLISON V1710-39 1000 HP

Model NORTH AMERICAN X73 1 PC-CLM A. T. C. --

ONLY BONA FIDE MEMBERS OF THE CREW MAY BE CARRIED

Weight empty as equipped -- lb. Gross weight -- lb.
(See equipment reverse side) (Not to be exceeded)

Maximum pay load is -- lb. with fuel of -- gal.

Maximum pay load is -- lb. with full fuel tanks 137 gal.

Cargo spaces: Location and capacity—OPERATIONS RESTRICTED TO MANUFACTURER'S FLIGHT TESTS IN THE VICINITY OF FACTORY WITH LANDINGS AT MINES FIELD & WITHIN THE CONTINENTAL LIMITS OF U S NO FLIGHTS OVER AIR SPACE RESERVATIONS NO PHOTOGRAPHIC MISSIONS

THIS CERTIFIES, that the aircraft described above is a civil aircraft of the United States of America and has been found to be in condition for safe operation.

REGISTERED OWNER: NORTH AMERICAN AVIATION INC

5701 IMPERIAL HIGHWAY INGLEWOOD CALIFORNIA

Unless sooner suspended or revoked, this certificate expires JULY 15 1941

BY DIRECTION OF THE ADMINISTRATOR:

Chief, Certificate Section.

ANY ALTERATION OF THIS CERTIFICATE IS PUNISHABLE BY A FINE OF NOT EXCEEDING $1,000 OR IMPRISONMENT NOT EXCEEDING 3 YEARS, OR BOTH

(OVER)

Sold to
Sold by
Date of sale

Form ACA-8—Rev. 7-10-40

10-40

16—16255

Boeing photo courtesy of John Fredrickson

Workers at the Archive were startled to discover a significant historic document in December, 2014. It is the original civil airworthiness certificate, dated 1940, from the sole P-51 prototype airplane known as the NA-73X. It is preserved because an NAA employee wisely returned it after two-decades in his custody.

The story of its preservation is noteworthy. The document was found stapled to an undated note. (The staples are visible at the top of the form.) Long-time North American employee, Arlie Staigh, wrote that he had been involved in dismantling the prototype Mustang in either late 1941 or early 1942. He removed the registration form and kept it for about 20 years – without mention of where it was retained (e.g., at work or home). He was working on the Sabreliner program (which first flew in 1958 and entered service in 1962) when he decided to return the historic document to officials.

The registration was issued in October 1940, immediately prior to the first flight of NA-73X at the hands of test pilot Vance Breese on October 26. Lacking any other guidance, it is presumed an unknown office administrator decided to file it along with other, mostly insignificant, general company correspondence dating from 1940 – where it remained until today.

In the manner of Arlie Staigh's important donation, the Boeing Historical Archive office touts its standing offer to adopt and provide a proper home for any North American Aviation historic photographs, documents, or artifacts you may wish to donate. The phone number is (425) 865-1780.

"History never looks like history when you are living through it."

— John W. Gardner

Contrails From The Past

by Ed Rusinek

Dear Ed,

I want to thank all of you at the Bulletin for all the years you devoted to publication. We all know that North American Aviation was a great company. It is a shame that as a company, it no longer exists!

Though I spent most of my years with the Company at the Cape on the S-II and at Huntsville on Shuttle Integration, the Downey facility was always my home.

— Carl Scheuplein, Cocoa Beach, FL

Ed's Ans.: Thank you for your kind words. Our team of volunteers has been together for fifteen years and we are ailing now, but sound the trumpet and we will rise up for one more charge!

Dear Ed,

Our Dad, Gerald Funk, told me repeatedly before he passed on, to send his bio to the Retirees Bulletin for the Silent Majority. He would always get so excited when the Bulletin arrived. He would take it to his room and spend hours reading and rereading it! He kept all the old issues. Thank you for making him so happy.

— Sandra Sellers (Oldest Daughter), Brea, CA

Ed's Ans.: Outsiders have noticed that I refer to NAA employees as NAA Family and ask why? It is because working for NAA was not merely a matter of turning out a product but rather belonging to a cohesive group of like-minded individuals engaged in the development, design, manufacture and flight testing of the very best machines to perform the task assigned. When you read "Dundalk Memories – Early Beginnings", *will you recognize the strong bond which held this group together. Only a closely-knit family could do this! Your father was a member of that NAA Family.*

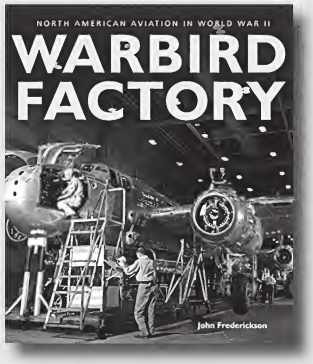
Congratulations and Best Wishes to

George and Louise Page
of Fullerton, California
celebrating their
58th Wedding Anniversary

James and Donna English
of Lakewood, California
celebrating their
50th Wedding Anniversary

Russel and Sandy Monroe
of Orange, California
celebrating their
50th Wedding Anniversary

I asked the Lord in heaven above,
to help me find someone to love.
A caring person, loyal and true...
He heard my prayer and sent me you.



WARBIRD FACTORY

NORTH AMERICAN AVIATION IN WORLD WAR II

by John M. Fredrickson

Explore the World War II history of the company that later became Boeing and made more aircraft from 1938 to 1944 than any other company in the United States.

During World War II, Los Angeles was the ultimate boom town. By the end of the war, the L.A. area had produced 17 percent of all of America's war needs. North American Aviation, Inc. (NAA), operating out of their main Inglewood, California, plant, which is south of and adjacent to the city, was a key player in that work. From 1938 to 1944, NAA built over 40,000 aircraft.

This is a fascinating story of a remarkable time in aviation history, when American businesses helped fund the arsenal of democracy that helped defeat the Axis powers. Warbird Factory tells this story with over 200 photographs, many of which come directly from the NAA/Boeing archives, where they have resided since WWII. This is an essential book for anyone interested in warbirds, aviation, Boeing/NAA, WWII, and/or the history of Southern California!

This hardcover book will be available November 1, 2015 and can be for pre-ordered from Amazon.com.

53rd Bald Eagles Reunion Luncheon

Photos by Sandy Snow



Michel Jiuf



Guest Speaker
Astronaut Jerry L. Ross



Astronaut Jerry Ross



Shanon Self, and Erik and Sharon Simonsen



Mike Juarez, Kimi Taira, Dorothy Nordlow, Pat Harling, and Kiyo Nakagawa



Beth and Cecil Clark



Erik Simonsen, Scott White, John Pierro, and Sam Iacobellis



Frank and Toby DeMattia



Gordon Palmer, Les Badin, Sandra Harvey, Floyd Mohr, and Beth Harvey



Paul Hirsh, Merle Johnson, and Joe Onesty



Tori and Mike Gleichman



George Fraser, Ann Tack-McLure, and Vic Harrison



Lee French and Susan Cohen



Scott White, Dick Edwards, Howard Browne, Matt Dougherty, and Winston Greene



Zung and John Pierro, and Gene Ricketts



Joe and Lina Szabo



Corm Wilkins, D'Lanie Blaze, and Fred Grin



Jerry Blackburn and Mike Aguilar



Dale Stinson, Earl Theaker, and Peggy Stinson



Cathy Baker, Sandy Snow, Jerry Ross, Shanon Self, and Sharon Simonsen

The Silent Majority

by Stan Guzy



MYERS, DALE D., 93 – of Carlsbad, CA passed away on May 19, 2015 after a brief illness. He joined NAA in 1943 as an aerodynamicist and wind tunnel specialist with projects relating from the P-51 Mustang to early jets. In translating some captured German Luftwaffe reports, he defined changes which led to the very successful swept wing F-86 Sabre. As Vice President of Weapons Systems Management, he led the development of the two-stage rocket and ramjet Navaho. When it was cancelled in 1957, he oversaw the B-52-launched Hound Dog nuclear weapons system. By 1963, 727 were completed at the Downey facility. In Spring 1964, he became Vice President and Program Manager of the Apollo Program which culminated on July 21, 1969 with Apollo 11 landing on the Moon. Shortly later, he was appointed Vice President on the Space Shuttle Program. In 1970, he joined NASA for a four year stint as an Associate Administrator Manned Space Flight. He returned to Rockwell in 1974 and took final retirement in 1977 with 30 years of service. Those who knew him, considered him the Best Program Manager of the Century!

AUGUST, RUDOLF, 82 – passed away on March 22, 2015. Rudolf was born in Poland on June 14, 1932 to German parents. After WWII, he and his wife immigrated to America in 1958. Rudolf began his career as a research physicist in the frontier field of electronics, developing diodes and transistors. He retired in 1989. He is survived by his wife, Sigrid.

BARBERA, FRANK J., 79 – passed away on March 29, 2015 at home in Yorba Linda, CA. After graduating magna cum laude from USC, Frank joined Autonetics in 1961, later transferring to Downey and Seal Beach. He worked on many space related programs for over 20 years including the first Global Positional Satellite. Frank continued his education while working, obtaining his MBA from USC in 1964 and a Ph.D. from UCLA in 1971 specializing in dynamics and control of satellites. Frank retired from Autonetics as V.P. of Advanced Strategic Systems in 1995. He is survived by his loving wife, Kelly.

BURG, ROGER A., 82 – of Laguna Niguel, CA passed away on June 12, 2015 of pancreatic cancer. Graduating from the University of Florida with a BSME degree, Roger joined Space Division in 1956 as an mechanical, propulsion and power engineer on the Navaho and Hound Dog projects. He advanced as Program Director on the Advanced Launch System (ALS), Saturn S-II Manager at KSC, and Shuttle Integration Project Manager. NASA recognized his achievements on the shuttle orbital flight test program by presenting him the NASA Public Service Medal in 1982. He is survived by his loving wife, Nancy.

CADWELL, GAI H., 97 – of Corona, CA passed away on February 22, 2015. Gai started at the Bell Aircraft Corporation on the Bell X-1 and subsequent early rocket ships. He was an engine systems designer and the principal engineer on the Orbiter Main Propulsion System (MPS). Gai was an Experimental Airplane buff and he built a VariEze from a kit that had a pusher-propeller in the rear. One Sunday at Ontario Airport, he was getting ready for takeoff when the engine quit. He jumped out and manually got the engine to start. At that moment, he slipped and got clipped in the head by the spinning propeller. Miraculously, he survived, but the propeller was totally splintered. Gai retired in 1983 from Space Division with 20 years of service.

CARR, POLLY, 91 – died on May 31, 2015 at Arroyo Grande, CA. Polly retired from Corporate Offices after many years of service. She was Secretary to Harrison Storms.

CHRISTIAN, MAUREEN, 79 – of Laguna Niguel, CA passed away on March 14, 2015 after a long-fought battle with cancer. Maureen joined Space Division in 1963 and worked her way up in Reliability supervision with integrity and resolution. She retired in 1995 with 32 years of service and remained with Boeing as a consultant. A single parent, she raised her two daughters, Rachel and Erika, with pride and great joy. She will be greatly missed by those who loved her.

COURVOISIER, NORMAN F., 93 – passed away on December 10, 2014 in Long Beach, CA. Returning from service in the Navy, Norman spent five years with McDonnell Aircraft in St. Louis. Relocating to Southern California, he joined Space Division where he served in the Instrument Lab in Downey for the next 30 years on the Saturn, Apollo and B-1 programs. Norm retired in 1981 with 30 years of service. He is survived by his loving wife of 68 years, Norma.

DONAN, JOHN F., 91 – passed away on April 2, 2015 after a two-year battle with metastatic prostate cancer, a battle he fought with great courage and determination. In 1962, he began his career at Autonetics. Subsequently, he moved to Space Division where he served as a subcontract

engineer for the display system for the first Space Shuttle. He retired in 1990. He is survived by his wife, Cecil.

FOSS, OLIVER "OLLIE", 88 – of Santa Maria, CA passed away peacefully on February 24, 2015. Ollie came to LAD and served for more than 32 years in Engineering and Facilities before he retired as Manager of B-1 Facilities in 1983.

FUNK, GERALD, 95 – passed away on February 2, 2015 in Brea, CA. Gerald came to LAD in 1940 and began on the P-51 production line. He married a coworker, Esther Jacobs, in 1943. In the 1970s he made parts for the Space program. He retired in 1978 with 38 years of service. The love of his life for 67 years, Esther, passed away in 2010. On his 93rd birthday, he took a fantastic ride in a P-51 Mustang.

GLOVER, JOHN "DON", 82 – died on February 23, 2015 in Morro Bay, CA. After serving in the Korean War, he moved to Orange County and settled there for 32 years. He joined NAA and completed 30 years of serves before retiring. He is survived by his wife of 57 years, Ann.

HANSEN, RUSSELL W., 73 – passed away on March 6, 2015 in Palmdale, CA. He had served in the Army Reserve and was a 45 year resident of the Antelope Valley. Russ worked on the X-15, XB-70, Apollo, Space Shuttle and B-1A/B before retiring as Director of Mockup and Tube Fabrication at NAA/RI. He will be missed. Russ was preceded in death by his wife, Sherrill, who was also an NAA retiree.

KOERNER, RICHARD A., 89 – passed away into the great beyond on January 26, 2015 in Riverside, CA. He is survived by his wife, Dorothy. Actual NAA/RI service information was not available.

LEATHERBY, SANDRA J., 76 – died peacefully in her sleep at home in Fullerton, CA on March 13, 2015. In 1961 she began her career as a financial analyst at NAA/RI which would last for 34 years until her retirement in 1995. Sandra is survived by her husband of 52 years, John.

NICHOLSON, KENNETH F., "NICK", 96 – of Anaheim, CA. Learning to fly during WWII, Ken served with the 364th Fighter Group in Britain flying P-38s and P-51s. Returning from service, he earned a degree from Cal Tech. He was with Douglas Aircraft and Ford Aeronutronics before joining NAA on the Space Shuttle. Ken retired in 1985 with 20 years of service. He is survived by his loving wife of 63 years, Dorothy.

PAULUS, JACK L., 87 – died on February 24, 2015 at his home in Anaheim, CA after a long battle with Parkinsons disease. Jack worked as an engineer at NAA/RI for 38 years before retiring. He enjoyed dancing and travelling with his wife of 49 years, Helen Louise.

REED, HAWLEY, 90 – of Gahanna, OH died on May 27, 2015 at home. Hawley retired from the Columbus Division.

YOUNG, RICHARD M., 82 – died suddenly on March 16, 2015 from undisclosed causes. He was an aerospace engineer for over 40 years and assisted in the birth and growth of the Space Age in the Army at the Army Ballistic Missile Agency and then as a high level Program Manager for the Apollo and Skylab projects and the NAA/RI SDI project. He is survived by his extended family.

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At press time, Stan Guzy is recuperating from surgery, but he will return for the Fall issue with more names for the Silent Majority.

NORTH AMERICAN AVIATION
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North American Aviation Retirees Bulletin
"Where The Best Never Rest"

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Photo courtesy of Lt. Col. Shad Reed, USAF

Attending the Faculty Brown Bag Luncheon at the USAF Academy were: (front row, l to r) Lt. Col. Jacque Joffrion, Col. Angela Suplisson, Lt. Col. Devin O'Dowd, Lt. Col. Shad Reed; (second row, l to r) Dr. Chuck Wisniewski, Dr. Aaron Byerley, Dr. Eric Stephen, Lt. Col. Michael Sobers, Capt. Jeff Newcamp, Dr. Daniel Raymer, Mr. Ken Ostasiewski, Dr. Martiqua Post, Lt. Col. Kyle Kolsti, Capt. Will Shackelford; (back row, l to r) Dr. Ki-Hoon Hur, Lt. Col. Young II Jang, Dr. Casey Fagley, Dr. Medhi Ghoreyshi, Dr. Tom McLaughlin, Dr. Steve Brandt.

NORTH AMERICAN AVIATION
Retirees Bulletin
"Where The Best Never Rest"

Fall 2015

Inside:

STRIKE AT NORTH AMERICAN AVIATION: JUNE 1941 by John Fredrickson

CONCEPTION AND DEVELOPMENT OF THE P-51 MUSTANG by Edgar Schmued

THE NAA NAVION, A NEAT DESIGN, A POST-WAR BUST by John Fredrickson

EDDIE AND THE ELEPHANT by Art Goudreault



Boeing Archives photo

A production Navion gracefully flies over the Statue of Liberty and Ellis Island in New York. The Navion was designed to meet the anticipated post-war demand for a light utility airplane. However, the release by the Government of thousands of surplus wartime airplanes at bargain basement prices overwhelmed the market for this sleek four-place airplane.

NORTH AMERICAN AVIATION
Retirees Bulletin

North American Aviation Retirees Bulletin, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAA Retirees Bulletin can be contacted at The Boeing Company, Seal Beach facility by phone at (562) 797-3836. Send mail to:

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Dear NAA Retirees Bulletin Subscriber

Now in our 16th year, the Bulletin has taken a new turn! For years, we have been struggling to find historical records and photographs related to activities at North American Aviation with very little success. Mike Lombardi, the Boeing Historian, was very helpful but limited in the NAA material he had available. Several months ago, his Historical Office was moved to an unused building in the outskirts of Seattle, followed by three trailer truckloads of NAA historical data. To add a final touch to this unexpected largess, John Fredrickson, a recent retiree from Boeing and with no connection to NAA, showed up and offered himself as a volunteer historian. Being an astute judge of the human spirit, Michael immediately accepted him and assigned him to sort and catalog this vast "mountain" of NAA history. Quick to respond, John has already published his first book about NAA wartime B-25 production in Kansas City. A second book will be available in December, which will encompass our entire company at war!

You readers will recall Lt. Col. Mike Gleichman from his letters published in *"Contrails from the Past"*. His grandfather was at NAA in the 1930s as an engineer and a teacher of aircraft lofting. Although he lives in Kentucky, Mike has family here in California. As a graduate of the U.S. Air Force Academy he is also helping us to get the Memorial Bench approved at the Academy. In his love and admiration for NAA, he reminded us that October 26, 2015 is the exact 75th Anniversary of the First Flight of the P-51 Mustang. To commemorate this event, he and several of his pilot friends with the cooperation of the Planes of Fame Museum Management have organized a P-51 Gathering and Fly-Over on that day. Everyone—Retirees and Families—are invited to come and enjoy this festive celebration of this fantastic airplane. The only cost will be a nominal charge for the BBQ Lunch. Not all Retirees have the forethought to subscribe to the Bulletin, so if you have any friends that are not subscribers please inform them of this happy event. Carpooling might be a very useful approach to get there. To get some idea of the number of folks planning to come, please notify us by phone or e-mail. **See details on Page 19.**

This issue of the NAA Retirees Bulletin is a Boeing edition, particularly a John Fredrickson edition. He provided the articles on the 1941 Strike and the Navion. He also enclosed a copy of Edgar Schmued's recollections in a speech he gave about the concepts and design of the P-51 Mustang.

After our first layout of this issue of the Bulletin, we ended up with a blank page. What to do? What to do? We reached back to 2007 for an article we published about "Dutch" flying alone from Washington, D.C. to Los Angeles and running out of gas and forced to make a landing on a lonely remote country road. To his surprise, he is rescued by a young man leading an elephant toting cans of gas! We are convinced that every thing that Dutch ever did or encountered had a certain verve or panache to it! Even in this instance, he couldn't be simply helped by a local farmer with a plow horse. (It was Depression time and very few folks had a tractor). It had to be a curious young man leading a circus elephant in the middle of nowhere!

As to the North American Aviation Memorial Bench at the U.S. Air Force Academy, the response has been a "deafening" silence. The Panel of Colonels has made a decision and no one will question or challenge that notion that a simple bench may somehow denigrate their beautiful campus. Since they are still on active duty, they are too young to remember or understand the staggering losses suffered by the Army Air Force during World War II. Over Europe we lost 41,802 Airmen, mostly B-17 and B-24 crews providing target practice as sitting ducks for the best Luftwaffe fighter pilots. The 8th Air Force was ready to stop daylight bombing to preserve lives when the long-range North American Aviation P-51 Mustangs joined the fray and totally reversed the course of the war.

After all these years of publishing the Bulletin without missing a beat, the years are catching up even to us! Say a prayer for us! We can use all the prayers we can get!

Strike at North American Aviation: June 1941

Reconstructed by John Fredrickson

"In conclusion, to sum up all observation, there is apparently great lack of proper attitude, that is, personal movement is too slow and lacks energy, an attitude that what does not get done today will be done tomorrow, and with the younger men there is little or no conception of seriousness or thought or importance to their work. There seems to be a tendency of riding a crest of a boom and buck passing is the password of the day."

—Inglewood plant internal management report, mid-1941

A malaise simmered among the many mostly young male workers employed at Inglewood during early 1941. Plant leadership noted the lackadaisical attitude of the workers and their morale was in a slump. North American Aviation entry level hourly wage rates were kept low in spite of hefty profits. Other industries were unionizing. New laws and actions by the Roosevelt Administration were favorable towards unions and, with a large, young, and restless workforce, the Inglewood plant was ripe for organizers. Two separate and competing unions went after the prize.

A bitter struggle had ensued starting in December 1940 between the United Auto Workers of America (UAW) affiliated with the Congress of Industrial Organizations (CIO) and the International Association of Machinists affiliated with the American Federation of Labor (AFL). The National Labor Relations Board sponsored a runoff election and the CIO won by a tiny fraction of the vote. The AFL challenged many of the ballots. The situation was further complicated by allegations that Communist sympathizers were striving to hobble American war production at the behest of the Russians then aligned with the Nazis in Germany.

Labor unions grew during the 1930s with the support of President Franklin Roosevelt's "New Dealers," who nurtured a supportive attitude towards organized Labor. Unionization became a right with the passage of the National Labor Relations Act of 1935 (also known as the Wagner Act). The strike became a legitimate tool to help workers bargain with parity against Management. Workers took over and held a Fisher plant during the famous 1936-1937 Flint, Michigan sit-down strike against General Motors. No work could be accomplished when police were beaten back with fire hose blasts and a barrage of auto parts as they attempted to seize the plant on January 11, 1937. Tactics consisting of court orders, gunfire, and tear gas were unsuccessful. President Roosevelt, himself, forbade federal intervention at the same time as the strikers were being provided with sustenance to include free food.

The Administration's stance towards Labor reversed course as a spate of strikes across all of America was becoming a serious impediment to the ramp-up of war-related production. Labor stoppages in early 1941 impacted shipbuilding, steel, and coal. A strike at the Allis-Chalmers plant in Wisconsin dragged on for 75 days, depriving shipbuilders of urgently needed equipment for newly constructed naval vessels.

Bargaining for the first contract at North American Aviation began in May. The rank and file workers at Inglewood, having never been represented by a union previously, found themselves unfamiliar with the time lags, drama, and frustrations inherent in the collective bargaining process. They voted to strike on May 23, 1941 but stayed on the job for 13 days past their strike deadline. The issue went to the National Defense Mediation Board when it quickly became evident that an indefinite stall was just beginning. The members ignored pleas from national union leaders to keep working, and walked off the job on Thursday, June 5, 1941.

The North American Aviation Inglewood plant then accounted for 20 percent of all military aircraft in June 1941 – including vitally needed trainers and medium bombers. The company held $196 million in contracts. A work stoppage would do incalculable damage to the British war effort and interfere seriously with United States defense preparations.

Discussion at the President Franklin Roosevelt's cabinet meeting of Friday, June 6, centered on the California walkout and it was decided that the government would seize the plant on Monday, June 9, if the wildcat strike continued. The President made that announcement on Saturday, June 7 and the War Department stated it was ready to act. However, nobody in government or Army service had any experience, contingency plans, or ideas about how to take over, let alone operate, a major airplane factory. They were without precedent.

The weekend was spent making hasty plans. Lt. Col. Charles E. Branshaw, the chief Air Corps procurement officer on the West Coast, was called upon to be the government's agent to operate the plant with assistance from Army legal, fiscal, and contractual experts. The mayor of Los Angeles offered up the "entire" police department to resolve the strike but military planning continued because the track record of local police at strike resolution was unfavorable.

The nation's top union leaders were in a serious dilemma. In the aftermath of the President's freshly declared "unlimited national defense emergency" dated May 27, 1941, they had firmly committed to their political friends in Washington, D.C. that there would be no strike. However, the newly organized North American West Coast union local, lacking the experience and maturity level of the Michigan-based auto workers, had mutinied against their leadership.

Richard "Dick" Frankensteen, a union president who earned his clout at Chrysler's Dodge plant, was flown from union headquarters in Detroit. He arrived in Los Angeles for a face-to-face gathering with union members in a desperate quest to promptly defuse the situation, but was, instead, mocked and jeered at the mass meeting on Sunday, June 8. Spiced-up with dramatic photographs and gripping newsreel images, the labor confrontation at Inglewood was a national story that received coast-to-coast press coverage. Newspaper and radio network reporting was intense. Army forces, already standing-by, were mobilized when officials received the news that the impasse remained unresolved.

Under cover of darkness, 2,600 troops were about to embark on their first skirmish of World War II. Troops from the nearby 3rd Coastal Artillery were augmented by two battalions from the 15th Infantry. The force was organized into three motorized columns and then dispatched with orders to halt temporarily within 30 minutes of the plant to await further instructions.



Boeing Archives photo

A high-ranking union official, Richard Frankensteen, was flown from Detroit to Los Angeles to dissuade workers from going on strike. He was taunted, heckled and booed off the stage when he tried to address the rank and file at a meeting on Sunday, June 8, 1941.



Boeing Archives photo

Acting on Presidential orders, fully armed Army troops entered the North American Aviation plant on Monday, June 9, 1941 and cleared it of union strikers and Communist agitators.

President Franklin Roosevelt signed Executive Order 8773 at 10:30 a.m. Eastern Time (7:30 a.m. Pacific Time) on Monday, June 9, 1941, at the same instant as a small Army spotter airplane circled quietly overhead in the crystal-clear Inglewood morning sky. Radio reports from the airplane were eagerly received every 15 minutes by commanders on the ground. It was their primary means to track the location of the troop convoys and the rapidly developing mob scene at the plant site.

Workers started arriving for their shift at 6:30 a.m. It was presumed that most were intending to work because they arrived holding lunch buckets; however, picketers, agitators, and other hotheads used intimidation to block the plant entrances. Fights soon broke out and a melee ensued. Police intervened at 7:43 a.m. and went into action by tossing tear gas into the crowd. The gas spewing canisters were quickly seized by strikers and thrown back over the chain-link fences which completely surrounded the plant. The defeated Los Angeles Police Department, in full retreat, was cowering under a hailstorm of rocks and bottles.

At 8:10 a.m. Lt. Col. Branshaw concluded that the efforts of local authorities had failed. With the situation deemed to be out of control, he ordered Army forces into action. The troops rolled in fully equipped for battle and dismounted their vehicles with bayonets affixed to rifles, live ammunition, and machine guns. There was to be no delay, no negotiations, and no nonsense. Soldiers, wearing their World War I-style helmets, marched smartly onto the plant premises in disciplined formations and quickly advanced directly towards the strikers and a confrontation.

The wildcat strikers could only briefly savor their still fresh victory over the large contingent of Los Angeles police officers. The force of 2,600 well-disciplined troops, bearing loaded rifles with fixed bayonets, was overwhelming. At the east entrance, a picket line manned on the leading edge by the most militant of the strike agitators was soon pushed back across Aviation Boulevard thus clearing an unobstructed pathway to the factory gates. About twenty of those who did not abide by orders were instantly taken into custody and loaded aboard Army trucks for transport to nearby Fort MacArthur for holding.

Before noon, North American Aviation security guards were able to open access gates and most employees streamed back to work when it became evident they were protected from further violence and intimidation at the hands of the strike proponents. Photographs show police then assisting with security by screening employees as they approached the plant entry gates.

Secretary of War Stimson stated the following at a press conference in Washington, D.C. on Monday afternoon, June 9: *"Mr. Kindelberger, president of this company, has a very good reputation with the government for making airplanes and is a square shooter. There are not enough like him. We do not want to do any injury to such a man. You may draw your own inferences from this."* The confusion within the War Department was evident when Branshaw, their on-site commander, was simultaneously



Boeing Archives photo

Armed with fixed bayonets and loaded rifles, Army troops escort a flag-bearing picketer off the North American Aviation plant premises during the June 9, 1941 wildcat union strike.

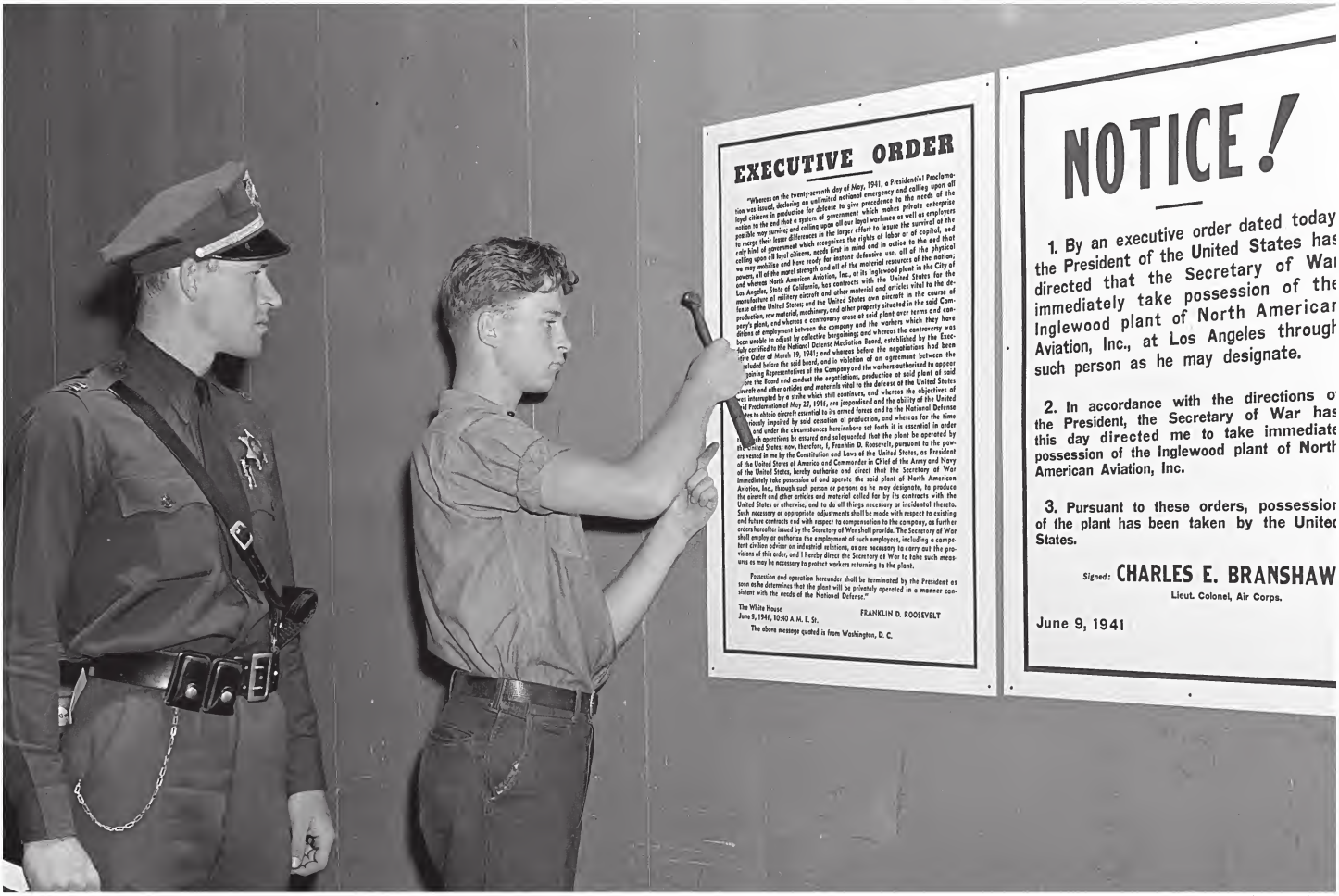
stating: *"North American Aviation has no voice in the operation. We are calling upon the company executives for information because they are familiar with the plant but we are calling up machinery for more extensive operation by government men."*

The seizure of the North American Aviation plant by the United States Army had turned out to be quick and easy. A graceful exit would prove to be more challenging. The government found itself in an awkward position and without precedent on how to proceed. Howard Petersen, a War Department special assistant quickly penned some wise objectives for such actions:

1. "The strikers must not gain an advantage. Otherwise, every American war plant will have a strike to force a takeover.
2. "The company has in this case had a completely clear record and must not be penalized by the takeover.
3. "If the government becomes the direct employer of labor an infinite number of technical difficulties arise..."
4. "In order to produce planes, complete management cooperation must be obtained..."

The general question of methods of operation was addressed at a White House meeting on June 10, 1941. Secretary of War Stimson later asserted: *"The President's views coincided with the others... in this case it was desirable to assume as little of the relationship of direct management to the operations of the company and its labor relations as possible, and that the company should be treated as the agent of the government for that purpose."*

No deaths and only one serious injury was recorded when a striker was accidentally bayoneted. The Army established its temporary presence at Inglewood when an occupation force consisting of 1,500 soldiers (of the original 2,600) bivouacked on the grounds adjacent to the plant as production resumed inside. The soldiers utilized the washroom facilities within the plant, making themselves at home as they settled in for the duration of their stay like a throng of eager tourists visiting relatives for the first time. Until emotions had time to subside, the temporary military presence would ensure that employees were safe from intimidation, sabotage was discouraged, and sit-down strikes would not occur.



Boeing Archives photo

Workers post notices that, in accordance with Executive Order 8773, the North American Aviation plant is under control of the U.S. Government.

The overwhelming demonstration of military might against unruly civilian citizens was deemed a success. The image of soldiers aiming machine guns towards striking fellow Americans is a sobering sight. The situation was tense but the consequence of decisive action was workers who, with the exception of their local union local leaders, accepted their lot and returned to work without excessive lingering anger.

Collaboration between union leader Richard Frankensteen and company executives would, on the surface, seem unlikely; however, dialogue with the Army regarding insubordinate union members was another matter. After consultation between Lt. Col. Branshaw and Frankensteen, nine of the most militant strike organizers were forever banished from not only the plant but also the union. Their cases were reviewed by prosecutors but, nobody was brought to trial for their actions.

Utilizing the hardball playbook of labor relations, the company obtained 8x10 inch prints from their own photographers, newspapers, and freelancers who extensively photographed the events of June 9, 1941, to ferret out systematically, identify, fire, and blacklist the strike instigators. The photographic prints remain in company files and the penciled names of suspected strike organizers can still be seen where they were annotated on the back of the prints. One fellow photographed on the picket line with his young daughter was determined to be an employee of Vultee Aircraft, another Southern California airframe builder also in the process of unionization.

After three weeks, the situation returned to normal, allowing the remaining troops to break camp and return to their barracks on July 3, 1941. An agreement between the union and NAA was signed on July 18, 1941. The concern about Communist influence on the union faded when Germany turned on their previous ally and attacked the USSR starting on June 21, 1941. An Army Air Forces report dated August, 1945 stated:

"The original realignment of wage rates at North American Inglewood was a direct result of the dramatic and significant labor disturbance of June 1941. This strike has been termed the most significant in the nation. The strike did not seriously affect production but it created a tremendous wave of national indignation directed solely at the strikers and other strike instigators."

The Japanese attack on Pearl Harbor would be the lightning bolt that galvanized pro-war public opinion. Sporadic labor work stoppages continued during the war years but the wave of patriotism which swept the country mitigated them. The war effort was never again seriously threatened by an organized labor disruption.

Editor's Note: Several days after the NAA strike attempt, Hitler invaded Russia and, probably, in the anticipation that American military assistance will be needed, the American Communist agitators were ordered by their Soviet "Controllers" to halt any further actions against the American production of military equipment.

Conception and Development of the P-51 Mustang

by Edgar Schmued

Editor's Note: In February 1971, a symposium on the conception and development of the North American Aviation P-51 Mustang, the classic fighter of World War II, was held in the Long Beach City College Auditorium. Edgar Schmued was a principal speaker. The Bulletin is indebted to NAA Historian, C. E. Ruckdaschel for transcribing verbatim and publishing Edgar's report presented here and to John Fredrickson of Boeing for recovering it from the NAA historical data accumulated in the Boeing History Office.

In 1908, I saw my first airplane. I was eight years old and I decided that was my cup of tea! I had the mission of building the fastest fighter in the world. That day came to me when Dutch Kindelberger came up to my office and said, *"Ed, do we want to build P-40s?"* I was horrified at the thought of building an obsolete airplane at North American. I said, *"No, I hope not!"* He said, *"Well, then get going and get me a proposal out. I am going to England in the next ten days, and I need an inboard profile, a three-view, specifications, performance and a weight statement."* So we got going and he got it.

It didn't take long and when he returned, he had a contract to build an airplane if we could guarantee to have a production airplane in one year. It sounded at the time totally impossible but we said we would do it. To do that, we had to have an experimental airplane and we decided to build one in a hundred days. Now, it never had been done before but we decided to try it. To make this story short, we failed by two days. It took us 102 days! We worked on this airplane every day until midnight. On Sundays, we went home at 6:00 p.m. That way, we knew it was the weekend. I had a real hard time keeping people from working past midnight. We never had such esprit de corps as we had at that time!

Dutch Kindelberger told me at the outset, *"Ed, you pick anybody in the Engineering Department you want, including a project engineer. No matter who it is, you pick them and they will work for you."* So, we had our choices spread quite evenly and we still had a sort of heterogeneous group. As you know, the fact that North American had always been consigned to building light bombers and trainers, the opportunity to design a fighter drove us a little harder! They made a real good team. A better team than you had ever seen before!

I didn't have to drive anybody because we had a very tight schedule. I let everybody make his own schedule because I knew the engineers were notoriously optimistic about what they could do. When I asked them how many hours they would need for the design of the wing and they replied, *"Four thousand hours."* I would reply, *"I don't want you to work so hard. I will give you six thousand!"* I knew damned well that they would work forty-eight hours a week to make it. It worked very well. We had a wonderful team and it worked like a charm.

Now, as we started, we had an aerodynamics department of one man, and that man was Ed Horkey. He had just graduated from Cal Tech and he had a lot of bright ideas, one of them being the laminar flow wing. Dutch Kindelberger asked, *"Well, suppose that wing doesn't work?"* I replied, *"Well, then I am going to build you a new wing in one month."* Of course, you know, it was impossible, but you know it was the spirit of the time.



Boeing Archives photo courtesy of Mike Lombardi

A debonair Edgar Schmued checks out a P-51 Mustang prior to delivery to Britain.

I had a tremendously free hand in this effort and that is partially responsible for the success we had in getting it out in one hundred two days. To give you an example: everything had to be scheduled and accomplished right on the nose! If we missed anything by a day that meant that the project would be late a day.

One of our big problems was the enormously huge magnesium landing gear casting. We went to some of the very well known foundries here and they said, *"Oh! We wouldn't touch that with a long pole. We have never cast anything as big as that."* So we went to a small company. I think its name was Osprey. They just made little bits and pieces out of magnesium, and we asked, *"Will you cast this thing?"* And they said, *"Gee! We never saw anything as big as that."* And then they added, *"We will do it!"* They didn't know what they were in for because I put a watchdog there. I had one of our stock chasers, who is a well known engineer today, and told him, *"You park yourself right there and if you see our part laying around, tell them you want some action on it now!"* Two days later he brought the finished casting in. It was so hot that he had burned a hole in the rumble seat carpet of his car. We got it in time!

Then we had another problem in the same assembly. The landing gear trunnion was a steel forging which had to be hand forged because at the time we just couldn't do anything else. The designer made one of those mistakes that happen! Instead of providing a diameter of 4.997 inches, he designated it as 4.97 inches. When we received the hardware, it was twenty thousandths undersize! This was a real catastrophe because it threw the whole schedule off! This was a "First". We racked our brains—what to do about it. We couldn't fire the guy because everybody makes mistakes! Finally, we decided to chrome plate the part twenty thousandths of an inch. It was the first time chrome plating was used to salvage a part and it put us back on schedule. We finally completed the assembly and installation and rolled out the airplane.

But we didn't have an engine! Those Allison people, from whom we were to get the engine, said, *"Oh, this has never been done before in our experience."* So, they were twenty days late delivering the engine. Also, you may have seen a picture of the plane with one aileron missing. Someone came running, as we rolled the plane out, with an aileron under his arm and we got it out on time!

Test flying was started and Vance Breeze took this airplane on and put it through the wringer, which he knows how to do. He found a few defects on it, which you can find on any new airplane.

One of them was hard ailerons. We asked what could be done in a hurry? We "borrowed" the aileron system from the T-6 and installed it. It worked like a charm.

Then we had another little problem with the engine cooling system. It wasn't quite good enough. At that time, Larry Waite from Engineering returned from McDonnell Aircraft in St. Louis and he brought with him a clever young fellow, an internal aerodynamicist named Joe Beerer. With the help of some British data, he fixed up that radiator. Now, I would like to tell you that this radiator was so darned good aerodynamically that on the latest model we had in production, the D, that radiator duct produced 300 hp thrust. That's a ramjet!

We had a lot of good things in this airplane. For instance, I laid out the lines myself. It was the first airplane that used second-degree curves all the way through. You could lay a section through any part of the fuselage and it was a second-degree curve. We had a good basic concept and some good details that made it a good airplane.

Then came the British! When we had the first acceptance flight scheduled, we had an Englishman show up who was six foot, three inches tall and lanky. The airplane was designed to British specifications for a man that was five foot, nine inches tall and weighed 140 pounds. He sat there with his knees under his chin but he never complained. The only complaint he had was, *"I don't understand you Americans, we do that very simply. We fire into the countryside and you would be surprised at how few people get killed!"* I might tell you that his impatience grew from the fact that to fire our guns during flight test, we had to get permission from the Coast Guard, which involved a lot of red tape and usually took three to four weeks. By the way, I might mention Art Chester, who was our model for our cockpit. He weighed 140 pounds as the British stated and stood five feet, ten inches tall.

When the airplane arrived in England, the first thing the British did was, and they confessed it to me later, knock seventy



Boeing Archives photo

With the completion of NA-73X, the first production Mustang bore the British-assigned designation AG345, followed by AG346 and AG347. All three aircraft were relegated to flight test.

miles per hour off our high speed estimate. They said, *"Gee! No American airplane ever imagined could go that fast."* Restricting the operational top speed branded the P-51 as only good for ground support work. So that is how the airplane entered into the war shooting up targets on the ground. It didn't take very long when they discovered that the plane was much better than they thought and that we were quite honest about the speed capability. Then they decided that they wanted more of these airplanes, but they couldn't get them for reasons unknown to me.

Note: Considering that the first Mustang production delivery was in August 1941, months before the Japanese Pearl Harbor attack, it is likely that the Lend-Lease Agreement with Britain was not yet in effect.

We were ready to store all the jigs when a week later we received an order for the A-36 from the U.S. Army Air Corps. They had not bought the Mustang before as a fighter so now they bought it as a ground attack plane. We had to add dive brakes. We built about five to six hundred of them when the Air Corps decided the Mustang was going to be an air superiority fighter.

We were well underway in production when we decided we were going to see what was wrong with the airplane because we heard so many complaints from the Air Corps as well as the British, *"Your airplanes are built too heavy!"* I got fed up with that complaint because we just could not do better under the circumstances. We wrote a report that explained why the British fighters were so much lighter than ours. There were lots of glaring reasons for it. One of them was the lower load factors. Their landing gear load factors were 4 ½ to our 6. That meant that you could jerk the American airplane around on the ground like a racing car and nothing would happen because the landing gear was built like a brick outhouse. The British pilots had to be a little more careful in handling their airplanes on the ground but they got used to the Mustang.

So we decided to write a comparison loading report. I tried to get the data on the Spitfire, and believe me when I say the British did not have a detailed weight statement on their airplane. One of our field representatives made the rounds in England and picked up enough Spitfire parts and weighed them. Finally, I had the only detailed weight statement for the Spitfire. I used it to make comparisons and found some good reasons why our airplanes were heavier and I pointed out that it was in compliance with a very serious Air Corps requirement. We printed about 25 or 30 copies of the report and sent it out. General Hap Arnold got hold of one of them and called up



Boeing Archives photo courtesy of Mike Lombardi

Edgar Schmued inspects the canopy for head clearance and workmanship in the cockpit of a newly manufactured P-51 Mustang prior to delivery to the U.S. Army Air Forces.

Dutch Kindelberger and said, *"If you guys are so damned smart, why don't you build one of these lighter Mustangs?"* That gave us the go-ahead for the P-51F, which was a light-weight airplane. We took 1,500 of the P-51D and made the P-51F, which later became the forerunner of the P-51H.

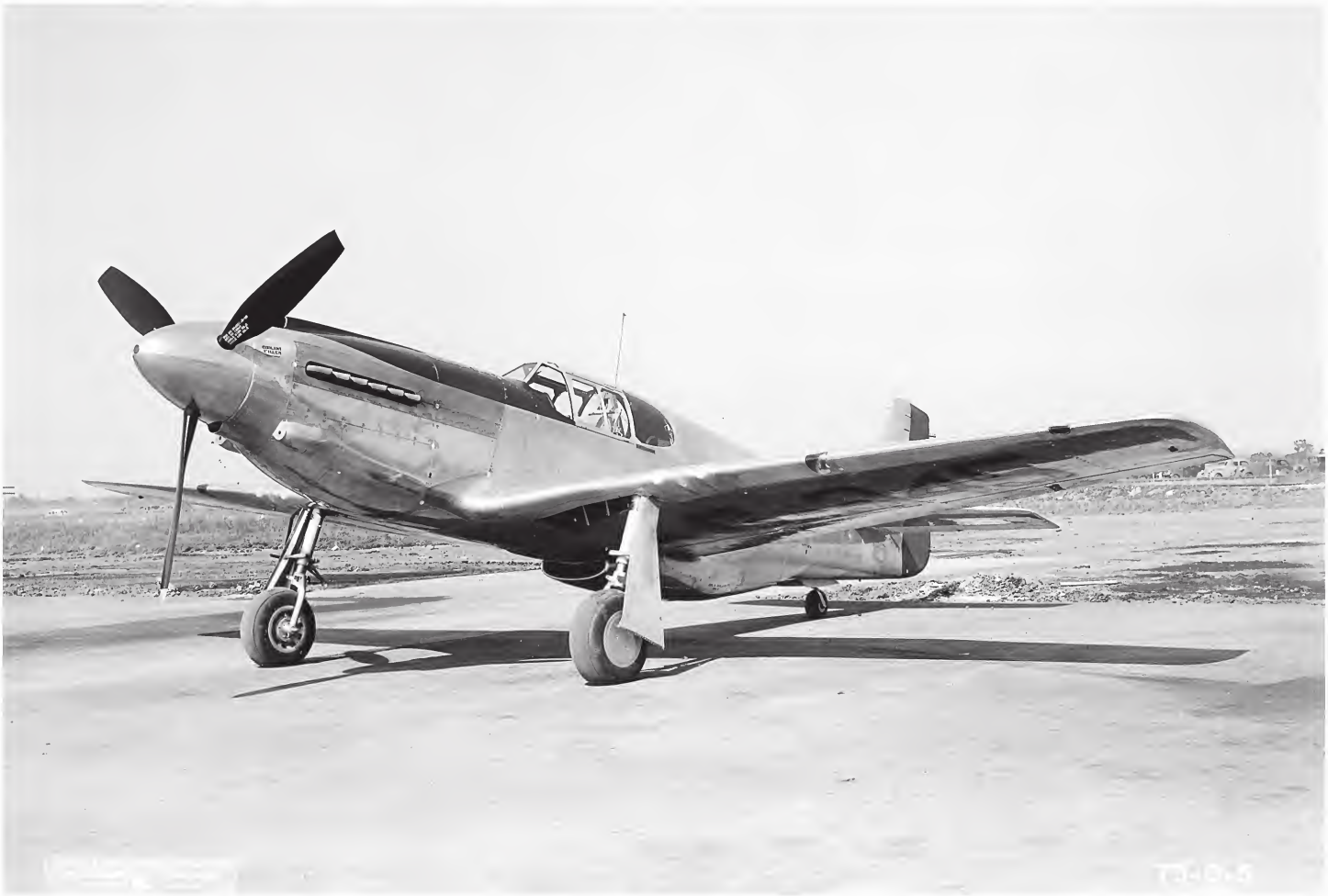
In 1942, I went to England and there was some horse-trading going on between Rolls-Royce, the British Purchasing Commission and North American Aviation. They gave us six engines and we promised them two airplanes. Later, they got the two airplanes, one of which had a five bladed Rotol (British) propeller. It looked sort of odd but it was a helluva good performer. That airplane actually went 495 mph and broke the speed record here for our fighters. It climbed at over 7,000 feet per minute but it had other problems that made us give up the concept.

We wanted to have the most modern fighter. We heard about a new aluminum alloy, that was stretched and heat aged. We tried working with the Aluminum Company of America (ALCOA) but they were filled up with production orders and stalled the idea of producing a special material for an experimental airplane. We decided we would make our own heat-aged material out of 24S Aluminum material. We stretched it, heat treated it and heat-aged it and, boy, we got the most wonderful stuff! However, you couldn't touch it—it would fall apart! One of the big issues was countersinking rivet holes. Previously, this had not been a problem because the skin material was thicker. Now with the thinner skins, you couldn't countersink for flush riveting so we had to dimple it. Every time we put it in the dimpling machine and made a dimple around the rivet hole, a little slug of metal fell out. We pretty nearly felt that we couldn't build it!

However, we had a very clever Chief of Research and he came to the rescue. He made a new kind of dimpling die, which we called a coin dimpler. To us, it was a revolution! The other manufacturers soon followed and it became an accepted method of manufacturing. These were some of the problems we had with the airplane.

I would also like to mention that when the bomber escort requirements came up in 1943 there just was no more room for another gas tank. The P-51 already looked like a Christmas tree with all the external tanks. The only place left was behind the pilot so we installed an 85 gallon fuel tank behind him. This made the airplane unstable. You had to literally "fly" it from take off until you used up the fuel in the tank. Then it was a good airplane again, and the pilots got used to this procedure.

One last item: the cost effectiveness of the WWII fighters. We built an airplane, the Mustang, that was very, very low in cost. As a matter of fact, it cost only 200 man-hours more to build than the T-6 Trainer. The next fighter, I will not mention which one, cost twice as much and a third one that cost three times as much. However, the attrition ratio of these three fighters was reversed. For every P-51 Mustang lost in action we got ten enemy aircraft. The second most costly fighter accounted for four enemy aircraft for each one lost and the one that cost three times as much accounted for one enemy aircraft for each one lost. So the actual final ratio was one to thirty: best to worse return!



Boeing Archives photo

A three-quarter front view of the sleek Mustang. The British assigned the number AG345 in their inventory of aircraft.

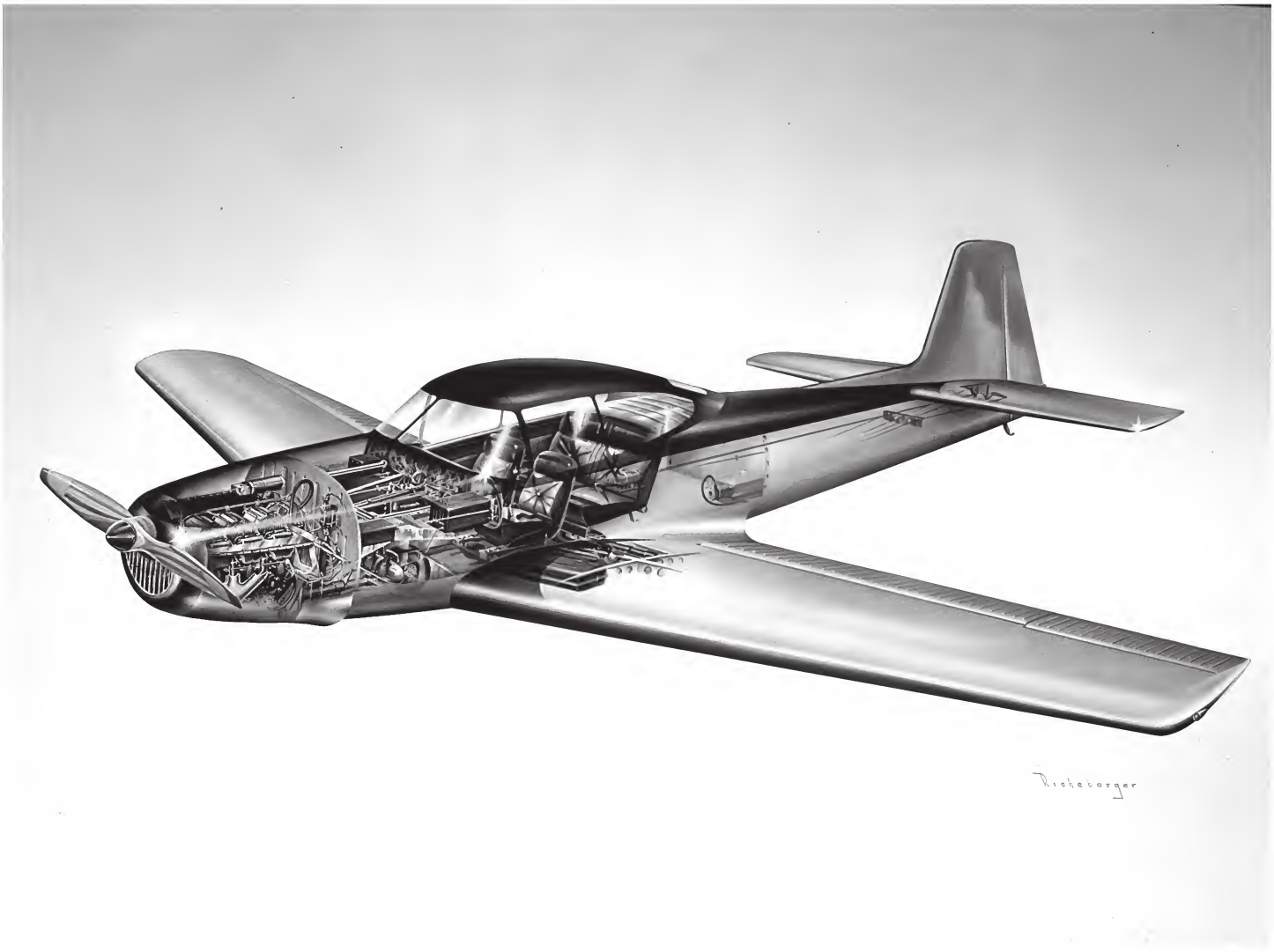
The NAA Navion, A Neat Design, A Post-War Bust

by John Fredrickson

NAA CEO "Dutch" Kindelberger was an aeronautical visionary whose business acumen included peering three years into the future. Even as military airplane production surged during World War II, he began pondering the lean years that would inevitably follow the wartime boom. North American Aviation (NAA) employment peaked at 91,000 employees during the hostilities before plummeting to a mere 5,000 survivors at the nadir of the post-war era. By the end of 1945, major NAA operations at government-owned plants located in Kansas City and Dallas were completely abandoned as operations at Inglewood contracted to minimal levels.

Beginning in 1944, Dutch Kindelberger and his inner-circle began pondering diversification opportunities to augment the developmental projects. The core competency of North American was building military airplanes; but, the medium-sized B-45 Tornado jet bomber and the F-86 Sabre jet fighter – then in the earliest stages of gestation – were not enough to sustain a big company. North American was desperate to retain more of their human capital, the experienced team of brilliant aerospace professionals needed for the next market upswing. Four strategies were explored:

- The option to build an airliner was probed; however, there were no modern designs in-hand. Developmental costs were estimated to be $10 to $40 million. Too many other companies were already in cutthroat competition with airliner offerings of every then-feasible size and range. Transport aircraft were quickly and wisely dropped from further consideration.
- Consumer goods were evaluated. Pots and pans were made of metal and metal fabrication was North American's forte. Kindelberger told his staff in 1944—as they thumbed the pages of a Sears-Roebuck catalog, *"Here are most of the world's consumer goods, described and priced. Let's see what we might manufacture at a profit."* The resulting financial figures from North American's estimators and accountants put internal cost to produce these low-end metal products at 30% higher than mail-order retail prices already available. That strategy was also abandoned.
- It was decided to proceed with the development of a small single-engine four-place airplane suitable for civil use. General Order NA-154 with the brand name of Navion was assigned to the project.



Boeing Archives photo

An Artist's cutaway view of the Navion, prepared for a slick NAA advertisement campaign.

- A project to convert war-surplus B-25s into executive transports and military trainers was also undertaken. It was estimated that 1,500 to 2,000 suitable airframes were available for conversion. They would be sold for $100,000 each – or a fifth of the cost of a new equivalent airplane. The nose was reworked and the windshield from a Convair 240 airliner was installed on a demonstrator. It was then flown to Washington, D.C. for inspection by Army and Navy officers. This project was abandoned when the prototype, on the return leg, crashed in a severe thunderstorm at Mesa, Arizona on March 25, 1950. None of the seven North American employees aboard survived.

As is typical when companies reach beyond their core competency, none of these diversification strategies panned-out. One project that Dutch Kindelberger came to publically rue was the NA-154 Navion (the post-war public relations people at North American had a penchant for products starting with the letters "NA" – others included Navajo and NATIV). The four-place airplane was designed for the high end of the single-engine personal aircraft market – another tough place to compete because other companies had already carved out their own niche and enjoyed a cost advantage. Government prognosticators had forecast demand for 450,000 private planes by the year 1950. They assumed that most every American household would aspire to own an airplane; however, demand petered out at about 100,000.

TECHNICAL NOTES – L-17 Navion

Engine:	Continental O-470-7, 185 hp
Max. speed:	163 mph
Range:	700 miles
Ceiling:	11,000 ft.
Span:	33 ft. 5 in.
Length:	27 ft. 4 in.
Height:	8 ft. 7 in.
Weight:	2,950 lb, loaded

The Navion, which first flew in 1946, offered excellent visibility, retractable landing gear, 150 miles per hour cruising speed, stable handling characteristics, and a significant payload which translated into 1,000 pounds or four adults plus their luggage. The problem was profitability. North American was saddled with the labor costs, overhead, and massive infrastructure associated with building military aircraft.

A bundle of money was sunk into the Navion design and unit production costs were at least $10,000; however, in competition with the slicker and faster Beechcraft Bonanza, it could only be sold for $7,000. The USAF ordered 83 of the design and designated it L-17. However, other demand was weak.



Boeing Archives photo courtesy of John Fredrickson

Hollywood heartthrob, Clark Gable, and SAC Commander, General Curtis LeMay, examine an early Navion, fresh off the assembly line at the Los Angeles Division.

North American production was halted after 1,085 Navions had been assembled.

Business improved in 1948 as Congress awoke to the rising worldwide Communist threat. An Iron Curtain in Europe established by the Soviets was an inkling that a Cold War was in the offing. Full rate aircraft production had returned to NAA by 1950, when the Communist North Koreans – with the assistance of the Russians and Chinese – invaded their neighbor to the south.

A small twin-seat open-cockpit trainer called NA-35 was in development in 1940 when it was abandoned as NAA became swamped by the first waves of war related business. Kindelberger sold that design to Vega for $100,000 cash. In a replay of that transaction a decade later, the design and rights to manufacture the Navion were sold to Ryan Aeronautical Company where production continued. The financial loss to NAA on Navion added up to a painful $8 million.

It was, no doubt, becoming evident to Kindelberger and his longtime trusted assistant, Lee Atwood, that North American Aviation, Inc. was trapped in a post-war bind. The business environment for building airplanes had shifted over the decade of the 1940s. It was neither feasible nor profitable to whip up a small batch of singular fighter or trainer airplanes for a customer like Peru or Thailand. Ever increasing complexity drove the developmental effort for sophisticated new models exponentially and that trend has never abated. Kindelberger contrasted the electrical system of a P-51 Mustang fighter to that of an F-86 Sabre jet fighter by comparing a doorbell to a television set.

Unable to downshift into the private airplane market and wisely avoiding the vicious airliner business where Douglas, Lockheed, Martin, Boeing, and the recently merged Vultee Aircraft Division and Consolidated Aircraft Corporation called Convair battled for every order – the North American leadership must have concluded privately that their future success would rely solely upon the largess of the federal government. The laudable peacetime diversification attempts had all failed. The future business base was to become inextricably linked to Congressional appropriations as contracted by the Departments of Air Force, Navy, Atomic Energy Commission and, eventually, NASA.

Author's note: Helicopters were still an infant technology as World War II came to an end; yet, no mention of rotary wing initiatives has been uncovered in North American files. NAA stayed with fixed wing aircraft, dabbled with drones in the form of X-10 and Navajo, while also pursuing rocket-powered flight and the many later Space related projects. Helicopters for both civilian and military applications may have been the missed opportunity in NAA's quest for post-war diversification.



Boeing Archives photo courtesy of John Fredrickson

One of the initial production Navions rolled out from the factory at LAD.

Eddie and the Elephant

by Arthur Goudreault, reprinted from the Fall 2007 issue of the Retirees Bulletin

The farm boy was named Eddie Heiller and here is his story as he told it to me years later. Dutch Kindelberger was flying his own airplane across country to Mines Field (now LAX) when somewhere over Kansas he ran out of fuel and set the plane down on a dirt road. In trying to turn the plane around, the landing gear got off the road and he needed some help to pull the plane out of the mire. A young farm boy came down the road to see an airplane up close. Dutch asked him to get someone with a team of horses and some gasoline for which he would gladly pay. The boy went off and, I suspect, Dutch settled down in the shade and waited.

One can imagine his surprise when he saw the boy coming back leading an elephant. The elephant was carrying a number of cans of fuel. It didn't take long to harness the elephant to the plane, pull it back on to the road and refuel it. Dutch was very thankful, paid for the fuel and in the conversation, gave the boy his business card and told him if he was ever in Los Angeles and wanted a job, to give him a call.

Now, Eddie Heiller was a very enterprising young man. There were no elephant farms in Kansas, but every year the circus came to town and the owners relied on Eddie to provide them with a year's supply of tent pegs. During the year Eddie would scout the local farms and garages for scrap rear axles, most of which he got for free or for a few cents. The steel rear axles made great tent pegs for the large circus tents and at 50¢ each were very profitable. He also became good friends with the circus people, so when he came down one day to borrow an elephant, it was easily negotiated.

Some years later, after finishing school, Eddie came to Los Angeles and appeared one morning at an NAA gate and asked to see Mr. Kindelberger. The guard would not let him in until he showed him the business card. The guard called and Dutch remembered and received him. He sent Eddie to the Employment Office with a note to hire him. Eddie started in the Tooling Department and loved every minute of it.

In 1940, North American Aviation opened facilities in Kansas City, Kansas and Grand Rapids, Texas to increase aircraft production. Eddie, along with others at LAD, was asked to relocate to Texas to organize, implement and maintain the culture and methods of the North American Way at that plant.

After the war, NAA gave up the Texas site and returned to LAD. The Grand Rapids facility was taken over by Chance Vought in 1949 and, after several name and organization changes, became LTV Aerospace Corporation, Aircraft Division. Eddie Heiller stayed with the facility and was still working there in the 1970s and 1980s. He became well known in the industry as very innovative, honest and hard working and became head of the LTV Tooling Department.

During the B-1A development program, Rockwell was funded for production and early long-lead material and subcontract planning. We submitted a Production Make or Buy Plan to the USAF/SPO in Dayton and soon after started competitive bidding on the large structural assemblies we would procure in support of the production phase of the program. We received bids from all the major aircraft manufacturers at that time. We did bid analysis, onsite fact finding and prepared a recommended source selection. LTV in Grand Rapids, Texas was the selected source.

It was during the selection process that I first met Eddie Heiller who was part of the LTV team. We toured the LTV manufacturing plant during the onsite review and he showed us the tooling techniques that were unique and very cost-effective in riveting large assemblies. One operator was able to handle by hand a very large piece of structure and perform automatic riveting operations. Through the use of slings in moving the assemblies, marking the riveting holes on the structure and identifying the size of rivets to be used, the parts could be assembled in a fraction of the time and with far less manpower. The quality of the work was extremely high. Eddie had not only developed the concept but also the mechanisms for the automatic riveting machine heads which allowed a selection of different size fasteners to be used as the machine recognized the requirements. At the time, his methods and techniques were a quantum leap forward in automation.

On July 1, 1977, President Carter halted the production of the B-1A. The development program, however, continued and we hung in there until 1980 when President Reagan reopened the program with limited funding.

During this time, Walt Sanders and I were visited by Eddie Heiller and John Dyer, the LTV Program Manager. Walt Sanders was the Rockwell Director of Major Subcontracts at the time. The substance of the meeting was that LTV had had a significant advantage in subassembly work using their automatic riveting processes, which they had developed and patented. They wanted to provide that technology to Rockwell for use on the B-1B as their contribution to make this program as cost effective as possible. Eddie Heiller said he felt he owed that to Dutch Kindelberger for giving him his career in aviation. I asked Eddie what it would cost us and he replied that nothing in life was free, so he would charge us $1.00 for the patent rights and for assistance in getting it started at our El Segundo, Palmdale and Columbus facilities. I decided it would not be prudent to try to negotiate a lower price. Walt Sanders and I drafted a one-page written agreement in my office.

I took them down to see Gene Ricketts, at the time Vice President of Operations and my boss. Eddie and John went over the deal with Gene and he felt it would be beneficial to the program. I told Gene to give them the dollar and both parties signed the agreement. LTV eventually built both the aft fuselage and the aft intermediate fuselage sections, did a great job on the B-1B program, never missing an aircraft on-schedule delivery.

Eddie Heiller retired from LTV not too long after the B-1B production program was going strong. The farm boy from Kansas, using a borrowed elephant to help a pilot flying to California during the Great Depression, had become an integral part of the history and success of the B-1B Program.

About the Author: Art joined NAA in 1959 in LAD Material. Over the years he rose in procurement management and became Vice President of the B-1B Material. With the conclusion of the B-1B program, he transferred to the Rocketdyne Division as Vice President of Material, which later became part of the Boeing Company. He retired in 1998 and is currently residing with his charming wife Sharon in Simi Valley, CA.

COMMENTARY

THE BATTLING BOYS OF BENGHAZI

We're the Battling Boys of Benghazi,
no fame, no glory, no paparazzi.

Just a fiery death in a blazing Hell
defending our country we loved so well.

It wasn't our job, but we answered the call,
fought to the Consulate and scaled the wall.

We pulled twenty countrymen from the jaws of fate
led them to safety and stood at the gate.

Just the two of us and foes by the score,
but we stood fast to bar the door.

Three calls for reinforcement, but all were denied,
so we fought and we fought and we fought 'til we died.

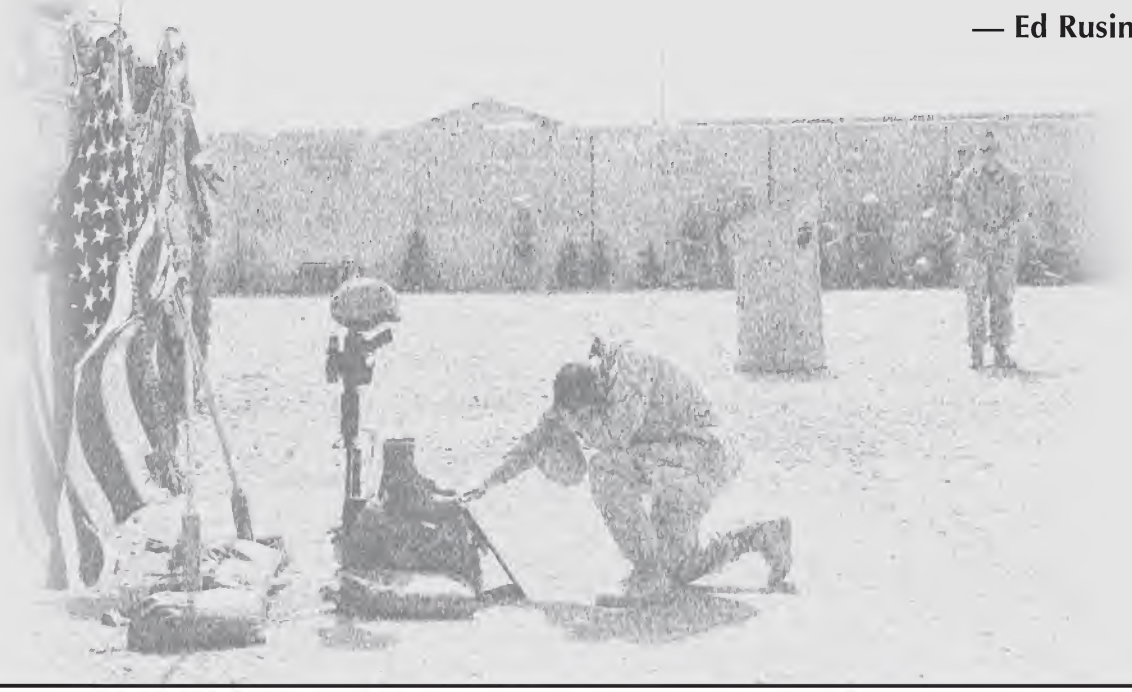
We gave our all for our Uncle Sam,
but Barack and Hillary didn't give a damn.

Just two dead Seals who carried the load
no thanks to us… we were just "Bumps In The Road."

— Anonymous Marine Corps officer

I felt that this message was important in this dark hour of our Country's survival. When a President forgets that his most sacred duty is to protect this Nation's most important treasures—the Men and Women serving in our Armed Forces, from General to the lowest potato-peeling Private—he no longer deserves to be addressed as "Mr. President."

— Ed Rusinek



Contrails from the Past

by Ed Rusinek and Stan Guzy

Dear Ed,

Remember "12214?" Many will recall this as the official Lakewood Boulevard address in Downey, CA of the NAA Missile Division and later the Space & Information Systems Division. Besides being the address on my paycheck for many years, 12214 was also the five digit number attached to the wall of the simple, round white brick lobby... through the door of which just happened to pass every astronaut who has so far set foot on the moon. Wow! How historic is that?

Well, if you want to get sick, just drive over and see what that "historic" 12214 Lakewood Boulevard entrance looks like today. Picture attached. You have to know what you are looking for because the number is long gone. Windows are broken and most are boarded up. You can see the sky through huge holes in the roof. Weeds are taking over everywhere.

I have no idea what's to become of this disaster. It should be protected from further damage and restored to its 1960s appearance. But it probably will be torn down – maybe just to make room for another used car lot.

— Dominick "Don" Schrello, Ph.D., Long Beach, CA

Ed's Resp.: That facility has withstood the occupancy of the Vultee Aircraft Co. some bleak years of the Great Depression and a very active North American Aviation with the windows intact, and the walls painted in whatever was the corporate colors of the time. During heavy rains, the roof leaked. Nothing was ever intentionally damaged. However, today our Society has developed a culture of human excrement that thrives on smashing windows, looting stores, attacking innocent civilians and disobeying the law. If they are hurt or killed by the Police in the process of maintaining order, the Police are charged with using unnecessary force on these poor, misunderstood Cretins! Thank you, Don, for bringing this to our attention.

Dear Stan,

Thank you for the kind words about my father, Dale Myers, in the Silent Majority. Our family is still in shock and grieving because his passing was so unexpected. When we last saw him, he was in great spirits and making us all laugh with his jokes. Your comment, *"Those who knew him, considered him the Best Program Manager of the Century"* made my family smile!

— Barbara Curtiss, Fallbrook, CA

Stan's Resp.: Perhaps, God wanted some angel wings to be redesigned and tested and your Dad was the best man to head up that project!

Dear Mr. Rusinek,

I have received the NAA Retirees Bulletin notifying us that our daughter, Ayesha, was presented with the North American Aviation Outstanding Achievement Award in Astronautics for 2015. I am very appreciative of your kindness in notifying us of this award, and also for including four copies of the issue. It was also interesting and fun to learn that my daughter and one other are the first young women to be recognized with these awards.



Dominick Schrello photo

The delapitated building that was once the proud main offices of Space Division in Downey. Through the front doors of this building walked all of the men who would later set foot on the Moon.

We thank you for your consideration in remembering the parents: the Academy doesn't do much of that as they let the cadets tell their parents of their achievements. While Ayesha was at the Academy, she was always working so hard that we didn't hear from her much and usually heard about any recognitions from others. Of course, parents love to learn of these achievements, so I very much appreciate your thinking of us. Thank you.

Best wishes to you and your associates at the Bulletin.

— Evelyn Hein, Honolulu, HI

Ed's Resp.: 2nd Lt. Ayesha Hein will be reporting to MIT to earn her advanced degree before she takes on her assigned duties as an Officer of the United States Air Force. We are confident that she will perform her duties with diligence and honor! God Bless her and all of the young Falcons graduating from the Academy.

Dear Ed,

My wife, Molly, and I attended the 53rd Bald Eagles Luncheon and we were totally impressed. The food was great: the table decorations fantastic; and the presentation by the guest speaker, Astronaut Jerry Ross, and the questions and answers afterward were outstanding.

It was an opportunity to renew friendships with coworkers and meet folks from other divisions that made NAA what it was. My forty plus years working with the best team of dedicated men and women was the highlight of my life.

God bless you and the Bulletin staff.

— Buddy Wymore, Yucca Valley, CA

Ed's Resp.: You will be pleased to know that the 54th Luncheon is already scheduled for April 30, 2016. Thank you for your Blessings. After 16 years with the Bulletin, the Staff needs all the Blessings we can get!

Dear Ed,

I look forward to every issue. You folks do a great job! I know I am already a Silver Eagle, but I feel like I already received a lifetime of the Retirees Bulletin! So here is another $100.00 to offset your costs and to keep up the good work. Thank you.

— Victor Lore, Torrance, CA

Ed's Resp.: Now in our sixteenth year of independent publication, over the years we have reported on almost every program, division and historical event associated with North American Aviation, Inc. With the enthusiastic support of the Boeing History Office, we hope to complete this saga with reports on the lesser-known vehicles such as the Navion in this issue. So thank you Victor for your kind words and funds!



Family photo from the collection of James Graham, the Grandson of Dutch Kindelberger

Dutch Kindelberger shows the nose section of a B-25 Mitchell bomber to Lt. Gen. William S. Knudsen, War Department Production Chief, during an inspection tour of the North American Aviation plant in Los Angeles on April 16, 1942.

The Silent Majority

by Stan Guzy

DAVIS, JAMES J., 94 – of Coeur d'Alene, ID passed away on June 17, 2015. After returning from the Army, having served in the Battle of the Bulge, he attended Ohio State University where he earned a B.S. in Engineering. Joining NAA at the Columbus facility, he was assigned to Production Planning, then as a design engineer on the A3J Vigilante and the X-15. In 1960, he was transferred to LAD on the XB-70 and, later, to Space Division on the Apollo as Chief of Production Planning. He retired in 1982 with 32 years of service ending as Director of Manufacturing Engineering and Development on the Space Shuttle program.

DIEM, HAROLD, 89 – passed away August 1, 2015 after a tragic fall. He served in the U.S. Navy during WWII, graduated from UC Berkley with a B.S. and from UCLA with an M.S. in Mechanical Engineering. He served at Rocketdyne as Program Manager of Advanced Technology Programs. He is survived by his wife of 59 years, Catherine.

GILLESPIE, ED, CAPTAIN, USN (RET), 86 – of Gahanna, OH took his last flight with an angel flying the "right seat" on July 9, 2015. A licensed pilot at 16, Ed joined the U.S. Navy at 17 and was accepted to the Navy flight training program. As a carrier-based fighter pilot during the Korean War, he flew many combat missions. Passing up a chance to fly with the Blue Angels, he entered the Navy Test Pilot Training School where he graduated in1956 and remained in the Reserve for an additional 26 years. Ed joined the Columbus Division and retired as Chief Test Pilot with 30 years of service, With over 15,000 flight hours, primarily accumulated in short, intense flights in single cockpit high performance aircraft there are few, living or dead, that can match his aviation accomplishments. He is survived by his wife Janette. His passing is especially sorrowful to the Bulletin because of his strong participation in placing the NAA Memorial Benches at Dayton and Pensacola.

KARLE, THEODORE, 77 – died peacefully in Fullerton, CA on May 1, 2015. After serving in the U.S. Navy, Theodore had a long career with NAA. He is survived by his wife Barbara.

McLOUD, DALE L., 90 – of San Clemente, CA passed away on December 24, 2014. Dale retired from Autonetics in 1982 with 31 years of service. He is survived by his loving wife, Ruth.

MUCKENTHALER, RONALD, 85 – of Dana Point/Laguna Woods, CA died on April 30, 2015. Graduating from USC, he served in the USAF during the Korean War. Joining NAA in Human Resources at Downey and Anaheim, he was a recruiter at universities all over the United States.

NEALE, HARRY L., 90 – passed away at home in Santa Ana, CA on July 28, 2015. Harry was a Technical Sergeant in the U.S. Marine Corps serving as a Corsair aircraft mechanic in the South Pacific. Returning home, Harry completed stints with several aircraft companies before joining NAA on the B-70 program in 1960 as a Production Change Analyst. He retired in 1984 as B-1 Supervisor of Manufacturing and Master/Detail Scheduling with 23 years of service.

OWEN, CHARLES T., 88 – of Tucson, AZ passed away on March 11, 2015. Charlie retired from Space Division in 1992 with 31 years of service. He is survived by his loving wife Evelyn.

PEREZ, LOUIS R., 90 – died peacefully on July 3, 2015 in Walnut Creek, CA. After proudly serving with the U.S. Navy in the Pacific, he came to NAA. Louis retired as Supervisor of Warehouse Services in the Los Angeles and Palmdale facilities with 40 years of service. He is survived by his wife Estela.

PERRY, JOHN R., 85 – passed away peacefully at home in Los Alamitos, CA on April 30, 2015. He joined Space Division in 1965 with a B.S. degree from Northrop Institute. He held several management positions including Apollo/Skylab, Saturn V Second Stage Test Conductor at KSC, and on the B-1A/B-1B. John continued to serve in management positions with Boeing including the X-31 VECTOR, E-4B Airborne Command Post, FSW Fighter, Next Generation Trainer, Towed Decoy and Airborne Laser programs. He retired in 2001 with 36 years of service. He is survived by his loving wife Sheryl.

ROEHL, ERNEST R., 86 – of Yorba Linda, CA died on June 16, 2015. Ernest earned his B.S. and M.S. in Electrical Engineering from the Missouri University Rolla School of Mines. After a stint in the oil fields of Texas, he joined NAA as a research engineer. He retired after 30 years of service with two patents.

RUSH, CLIFFORD A., 89 – passed away on May 27, 2015 in Santa Maria, CA. Cliff retired from Autonetics in 1991 with 30 years of service. He was very active with the Santa Maria Amateur Radio Club up to a few days before he died.

SHAW, JAMES A., CAPTAIN, USN (RET), 73 – of Westerville, OH passed away on July12, 2015. A graduate of Indiana State University, Jim served on active duty in the U.S. Navy as a pilot for five years during the Vietnam War. His squadron provided anti-submarine and anti-ship patrols to the carrier battle groups in European waters, flying the Grumman S-2F aircraft affectionately known to its crews as the "Stoof" and its pilots as "Stoof Drivers". Jim made 124 arrested landings on five different carriers and continued to fly in the Naval Air Reserve for 27 years more years of service. Jim is survived by his loving wife of 50 years, Roberta. A fine gentleman, Jim will always be remembered at the Bulletin for his grand participation in obtaining the NAA Memorial Benches.

SUFFECOOL, CLARENCE "CHUCK", 88 – of Laguna Niguel, CA passed away on August 13, 2015. Chuck was an electrical engineer for the Inertial Navigation System installed on U.S. Navy nuclear submarines. He retired from Autonetics in 1988 with 33 years of service.

WALSH, DANIEL C., 90 – passed away at home on December 5, 2014 in Redlands, CA. He joined NAA in 1947 after service in the USAF as a crew chief, flight engineer and mechanic. His assignments with NAA extended to Albany, GA where he participated in the design and manufacture of the Aero Commander 112, from design to first flight in less than one year. His last assignment was in Tulsa, OK where he retired in 1987.

LOST SHEEP, BULLETIN RETURNED WITH NO FORWARDING ADDRESS

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JACK W. SMITH – COEUR D'ALENE, ID

The Friends and Fans of the North American Aviation P-51 Mustang invite all NAA Retirees and their families to be Honored Guests at the

North American Aviation P-51 Mustang 75th Anniversary Gathering and Fly-Over

Monday, October 26, 2015

Planes of Fame Air Museum

7000 Merrill Avenue, #17

Chino, California 91710

Tentative Schedule:

10:00 a.m.	Planes of Fame Air Museum doors open
11:30 a.m. – 1 p.m.	Lunch & Social – Maloney Hangar – Stories, Photos, Memorabilia (BBQ Lunch - Nominal Charge $8.00)
1:30 p.m.	P-51 Fly-over, Static Displays of B-25, SNJ, T-6, F-86, F-100, other NAA related Models
3:00 p.m.	Final Salute and Memory Board

If your Retiree is too ill to come or has joined the Silent Majority, please come in their Memory and place your name/their name label on the Memory Board. If you have an anecdote or a brief story you would like to share, write it up and bring it and attach it to the Memory Board too! You are all North American Aviation Family and WE LOVE YOU!

Please RSVP by Wednesday, October 21st to:

Ed Rusinek
Phone: (562) 797-3836 Give Name, Phone No. and Number in your Party
E-Mail: KENISURE@SOCAL.RR.COM Provide the same information

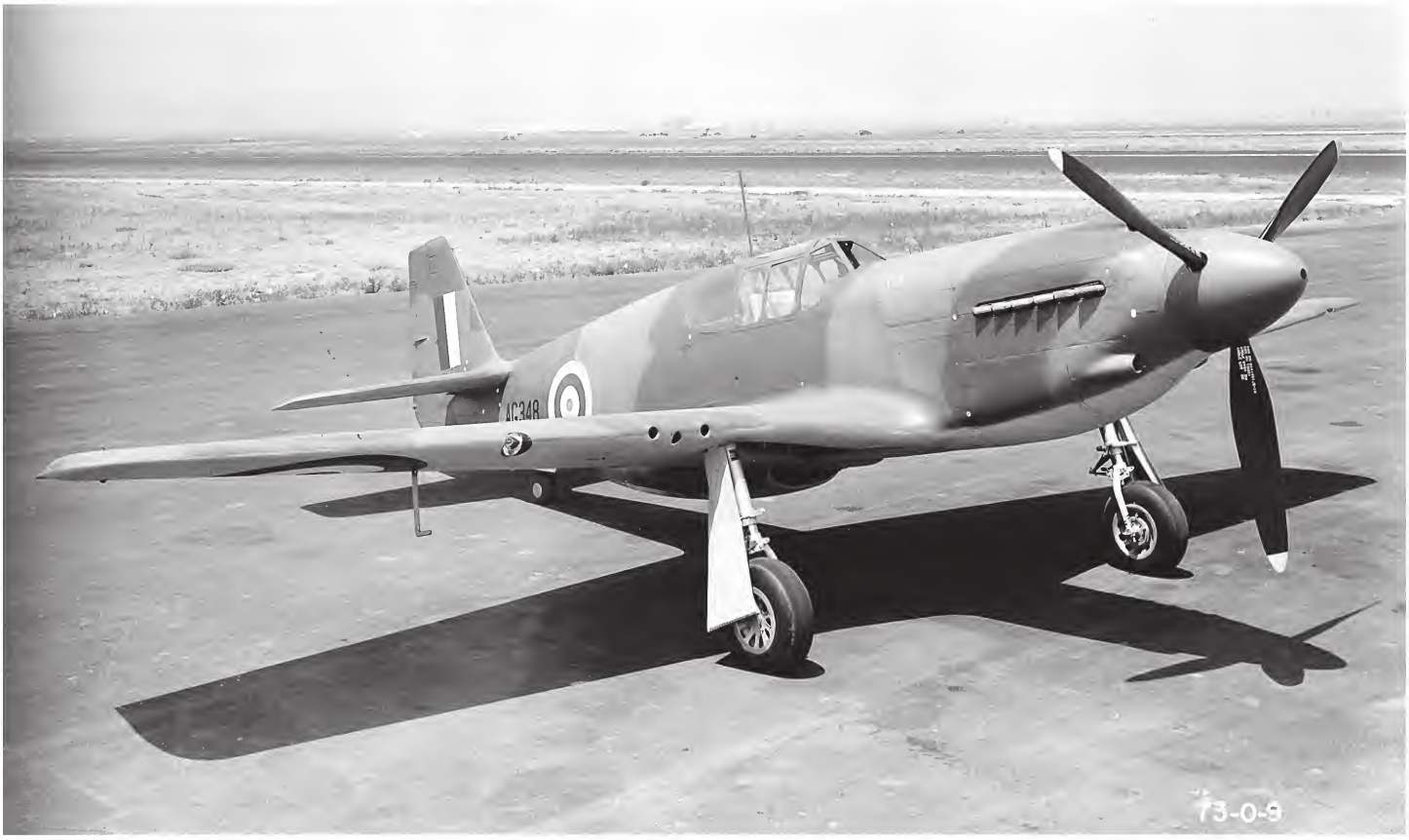
As the years go by, the shadows we leave behind seem to grow longer so let us unfurl the colors and make this one more charge ahead together, as we had done so many times when Our Company was alive!

NORTH AMERICAN AVIATION
RETIREES BULLETIN
P.O. Box 3797
Seal Beach, CA 90740

North American Aviation Retirees Bulletin

"Where The Best Never Rest"

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Boeing Archives photo

Painted in British camouflage and markings, RAF Mustang Mk I, number AG 348 is ready for delivery to England to fight for the free world against Nazi Germany.

NORTH AMERICAN AVIATION
Retirees Bulletin
"Where The Best Never Rest"

Winter 2015

Inside:

APACHES OVER ITALY by Jay Stout

REMEMBERING MY GRANDPA, DUTCH KINDELBERGER by James Graham

LANCE MISSILE POWERED BY ROCKETDYNE by Jim Bates



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***On June 5, 1944, one day prior to the onslaught at Normandy, Clarence E. "Bud" Anderson, with the 363rd Fighter Squadron, 357th Fighter Group, was escorting bombers bound for Germany when he was intercepted by an Me 109. Bud strafed his attacker and the German dove down to the deck. As Bud closed in, the enemy pilot made a fatal mistake—inching his stick forward, he impacted the ground at full power and exploded. Aviation artist William S. Phillips captures that moment in his painting* "A Bandit Goes Down."**

NORTH AMERICAN AVIATION
Retirees Bulletin

North American Aviation Retirees Bulletin, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAA Retirees Bulletin can be contacted at The Boeing Company, Seal Beach facility by phone at (562) 797-3836. Send mail to:

North American Aviation Retirees Bulletin
P. O. Box 3797
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Dear NAA Retirees Bulletin Subscriber

With this Winter Issue we complete our 16th year of publication. For us in the sunset years of our lives, each passing day has its own importance, its own reflection. We watch our family members and our friends slip away into that eternal night and we become more aware of our own vulnerability. This passing year has been particularly difficult because we witnessed so many of our friends and colleagues embark on that final journey. A few must have died in total lonely isolation because we only learned of their passing by their issue of the Bulletin being returned and coldly stamped "DECEASED." To all of them we say, "Farewell and may God welcome you with all His Blessings."

On Monday, October 26th, I participated in the 75th Anniversary of the First Flight of the P-51 Mustang air show at the Planes of Fame Air Museum in Chino. The program was initiated, implemented and held by Col. Mike Gleichman with the splendid assistance of his family and Erik and Sharon Simonsen. The P-51 made several passes overhead, which I hoped would be lower, but law forbids passes under 1,000 ft. This was my first visit to the museum and I was very impressed by the tremendous variety of aircraft. Reminded me of a visit I made to Selfridge Field in 1937 at the age of ten. The flight line had dozens of sleek Seversky P-35s and hidden in a hanger was a Martin B-10, the secret *Mystery Bomber*.

Our inclusion of the Benghazi poem in the last issue aroused much patriotic fervor from our readers and TWO complaints regarding our critical "meddling" in current political issues! One complainer informed me that my comment was inappropriate for our "little newsletter" and we should limit ourselves to NAA aviation history. I suspect that Patrick Henry was given the same advice when he made his famous *"...give me Liberty or give me Death"* speech! Everybody remembers Patrick. No one remembers his critic! No one!

We have some very interesting articles. With the P-51 action paintings reproduced on the covers, they almost demand that we have a P-51 combat article in the Bulletin. What better resource to do that than Jay Stout? This time he provides us with an exciting story about a USAAF pilot flying and fighting over Italy in the early version of the Mustang, the North American Aviation A-36 *Apache*.

Through the kind folks in the Boeing Historical Office, we learned that "Dutch" Kindelberger's grandson, James Graham, was residing in Orange County. We gave him a call and he was pleased to do an article about the exciting life he had as a grandson of the most famous industrialist in California.

From Rocketdyne, Jim Bates provides us a detailed look at the development, design, testing and operational use of the Lance Missile. Usually, when you think of an aerospace company, it entails one or two projects. But, with North American Aviation the effort and results stretch in every direction with fantastic results!

Since this issue is the last for 2015, it is time for subscription renewals. **Please look at the address block on the back cover. If it says DECEMBER 2015 above your name, this is your last issue and you must renew.** Just write a check for $15.00 per year made out to Bald Eagles, Inc., and send it to:

NORTH AMERICAN AVIATION RETIREES BULLETIN
P.O. BOX 3797
SEAL BEACH, CA 90740

In this holiday season, our thoughts turn to you, our subscribers, and, we hope, our good friends. We include you in our prayers and we wish that all of you share in God's Blessings of peace, good health and long life. *Amen! Shalom Aleichem!* Our Volunteer Staff Members, Sonnie Robertson and Stan Guzy, are still afflicted with medical issues. Please remember them in your prayers. Thank you! — Ed

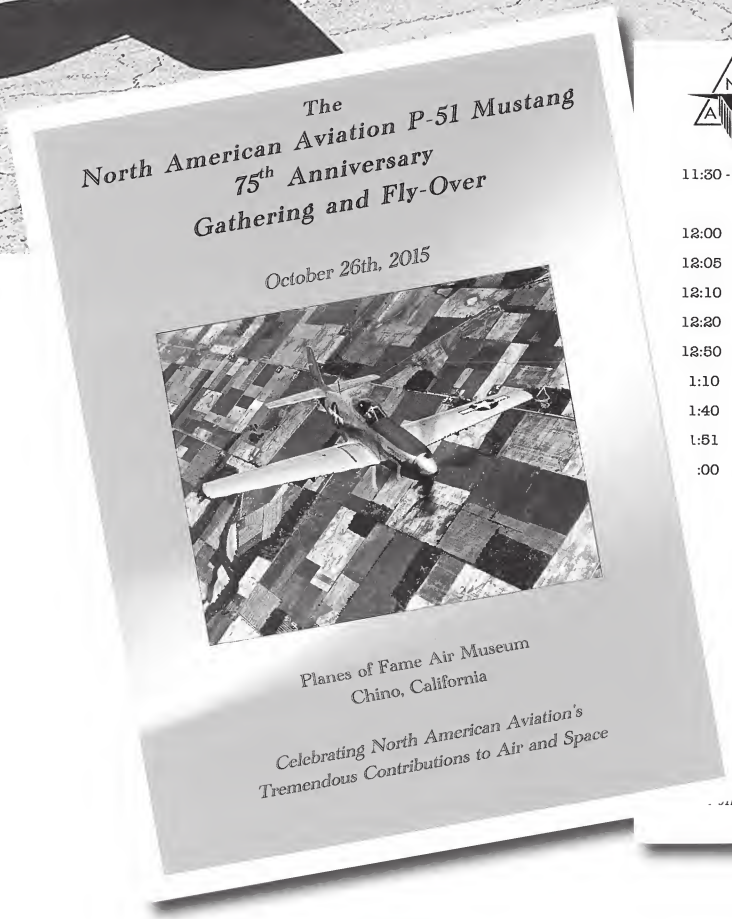
North American Aviation P-51 Mustang 75th Anniversary Gathering & Fly-Over

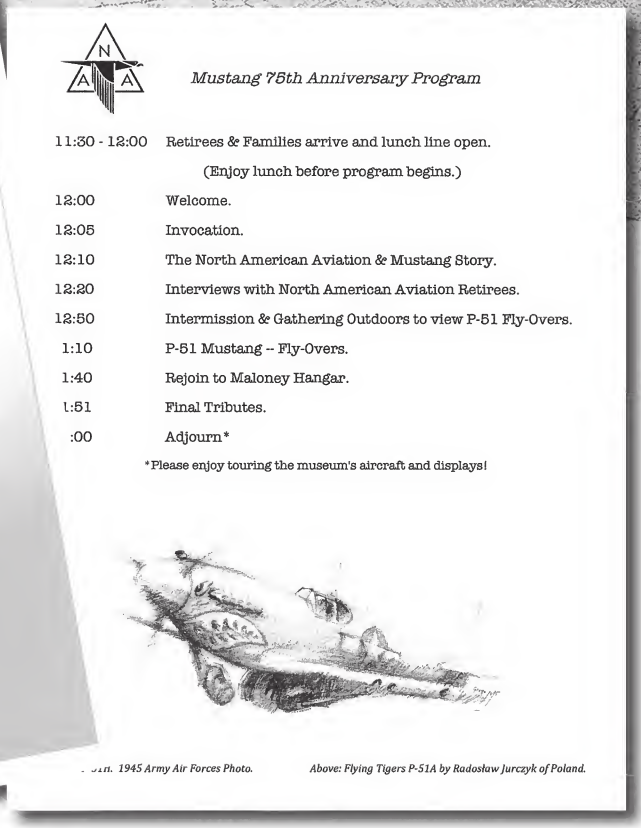
Photos by Erik Simonsen, Craig Kaston and Lynn Ragone

The North American Aviation NA-73X, the prototype of the legendary P-51 Mustang fighter first flew on October 26, 1940. Commemorating this event, a gathering of the men and women involved with the P-51 Mustang was held in the Edward Maloney Hangar at the Planes of Fame Air Museum in Chino on October 26, 2015—75 years to the day of that historic first flight.

Organized by Colonel Mike Gleichman and his family and with the assistance of Erik Simonson and his wife, Sharon, the anniversary gathering also featured a rare Allison-engined P-51A Mustang similar to the NA-73X. As the P-51A started its engine, taxied to the runway and took flight for a short series of flyovers over the museum, the attendees all looked on with pride and nostalgia. What a fitting tribute to North American Aviation, its employees, and the airmen who flew and maintained the greatest fighter of World War II!








PLANES OF FAME
AIR MUSEUM






JOHN PIERRO


13
P-5


WILLY
G4








Miss Virginia

Apaches over Italy

by Jay A. Stout

Author's Note: The A-36 Apache was a dive-bombing variant of the Allison engine-powered P-51A. It came to exist only as a result of what was, in effect, a Government contracting gimmick intended to keep the P-51 line open until funding became available for the P-51B and subsequent models. In total, only 500 were produced.

For the dive-bombing mission, aside from being structurally strengthened, the A-36 had a redesigned wing that was fitted with slatted, hydraulically operated dive brakes on top and bottom. These devices kept the aircraft from accelerating above about 400 mph in the near-vertical dives typically favored. In practice, the aircraft was put into a dive from approximately 12,000 feet and the two, 500-pound bombs—one under each wing—were released at an altitude of between 2,000 and 4,000 feet. The A-36 also carried two .50-caliber machineguns in the lower nose in addition to the two .50-caliber machineguns mounted in each wing.

The A-36 first arrived in the Mediterranean theater during March 1943 and started combat operations in June. Although the original P-51 design was never intended as a dive-bomber, the A-36 proved to be quite effective in the role. Still, notwithstanding the fact that it was a derivative of the P-51, its performance at high altitude was inferior to that of the virtually unequaled Packard Merlin-engined P-51s that were fielded later. Its Allison engine—which was smooth, reliable and powerful at lower altitudes—lacked the supercharger equipment needed for good high altitude performance. Subsequently, although the A-36 acquitted itself well enough as a fighter at lower altitudes, it was a poor performer above about 15,000 feet. It certainly did not dominate the standard Luftwaffe types of the day.

During the Spring of 1944, the tactical Allied air forces in the Mediterranean were dedicated primarily to ground attack missions in support of the advance up the Italian peninsula. By that time, air superiority had been virtually established and the Luftwaffe almost never made an appearance. But only almost.

John Blair Watson started flying A-36s with the 86th Fighter Bomber Group beginning in October 1943. By April 18, 1944, Watson had flown more than 50 missions and was flying more often as an element or flight leader, and less often as a wingman. On that particular day, he was scheduled to fly as the 525th Fighter Squadron airborne spare on a group mission to destroy railroad tracks along the Rome-Orte route. If an aircraft aborted the mission for whatever reason prior to crossing into enemy territory, Watson was to take its place.

This airborne spare was frequently needed. Watson recalled that some individual pilots dropped out of missions repeatedly while others never seemed to abort. He remembered, *"I had a roommate about whom we began to worry because he turned back often."*

The 86th scheduled the mission of April 18 as a three-squadron effort, with each squadron providing eight aircraft, plus airborne spares. It wasn't necessarily typical for the group to fly as a whole. However, Watson remembered that, *"Our intelligence section informed us that German fighters had been appearing more and more frequently in skies which we had foolishly come to consider our own."* As a result, the group leadership wanted to present strength in numbers.



USAAF

An aerial view of an A-36 of John Watson's 86th Fighter Bomber Group.



USAAF

An A-36 and its ground crew at an Italian airfield.

The group formed and set a course up Italy's west coast soon after takeoff from its base at Pomigliano. It wasn't long before Watson's squadron commander dropped out of the flight. Leadership of the eight-plane formation now fell to Watson. As he added power to slide into the newly-vacant squadron leader's position, the original wingman refused to ease back and give him room. *"Things were getting a little uncomfortable until someone in the rear of the squadron … broke radio silence and said,* 'Get the hell out of there Brinley, Watson's supposed to be leading!' "

Watson's flight of eight was positioned low and to the right of the lead squadron at 12,000 feet. He saw that clouds were building ahead, potentially blocking the route into the primary target. Accordingly, he noted to himself that his squadron's secondary target at Viterbo, about ten miles inland, appeared to be clear. In the event that the group aborted the primary mission, he was determined to take his flight to Viterbo.

This determination was the product of earlier frustration. *"I was conscious that my decision was … influenced by the fact that on several missions I had felt that we had not been aggressive enough, that we had aborted missions for flimsy reasons. If the leader wanted to abort, no pilot was likely to object, for another mission would have been accomplished as far as the record was concerned … I had vowed to myself that, if I were leading, we would attack any target which seemed at all reachable."*

As it developed, the lead squadron started a sweeping left-hand turn out over the sea where the aircraft could safely jettison their bombs before returning to base. It was aborting the mission. The second squadron followed suit. Watson didn't follow, but rather swung his formation around in a right-hand turn toward Viterbo through which a road and railroad ran.

Approaching the town, Watson spread the formation and started the group down in a shallow dive to pick up speed. *"Almost directly over the target I pumped my stick back and forth to signal that I was about to open my dive brakes, and then did so."* He rolled his aircraft nearly inverted and let the nose fall through the horizon and down toward the target. *"I picked out the railroad yard in my gunsight."*

Rather than following Watson, the rest of the formation scattered when his wingman, seemingly confused, arced away in a different direction. *"Blind to what had happened,"* Watson remembered, *"I dropped my bombs, firing my guns at the same time, hoping to scatter any German gunners who were lining us up in their sights."* Watson passed through 2,000 feet before he wrestled his aircraft out of its dive and pointed it skyward. He closed the dive brakes and steepened his climb. *"It was always like getting a kick in the pants when the dive brakes closed,"* he recalled. *"The plane seemed to slide ahead as if the sky had been greased."*

Watson started a wide, left-hand turn after arriving at the off-target rendezvous point. Beyond his shoulder he could see black smoke swelling up from the rail yard at Viterbo. He, and at least some of the rest of the squadron, had struck two separate strings of boxcars.

What he didn't see was the rest of his flight. After a turn or two, he was joined by another A-36 but the remaining planes were nowhere to be seen. *"There were some other aircraft in the sky,"* he remembered, *"But they were much higher and too many to be the rest of my squadron."* Blair noted that the other group started toward him and he supposed that it might have been the other two squadrons; perhaps they had decided to hit the same target.

"Suddenly, tracer fire began to cut across the circle we were making," remembered Watson. The other group was obviously not friendly. He noted that the radio frequency was suddenly clobbered with the sound of Americans cursing and shouting. An instant later he caught sight of a group of P-40s in a melee with enemy fighters. At the same time, pairs of Me 109s flashed past, jockeying to get into position behind him and the other A-36.

Watson wrenched his aircraft through a series of brutal maneuvers, hoping that his new wingman would be able to hang on. Desperate to shake the far more numerous enemy fighters he pulled hard over into a right-hand turn and dove into a heavy line of clouds. A moment or two later he was out the other side where, almost surrealistically, there was nothing

to be seen. *"It could have been a fine spring morning anywhere,"* he recalled. In his new happy place there was no one that wanted to kill him. In fact, there was no one at all.

Watson started south down the friendly side of the line of clouds and encountered nothing. He reversed course and continued back north until he came to an opening through which he could still see smoke rising from the rail yard at Viterbo. Anxious to rejoin his friends, Watson darted though the gap and started looking. What he found was the same large group of Me 109s milling about, a couple thousand feet above him. And in the distance the P-40s were still preoccupied with their own fight.

The enemy aircraft, numbering about sixteen, dove down on Watson in pairs. The first two Me 109s began firing at him from very long range. *"I chopped my throttle and pulled the nose around as tightly as possible. I looked down my left wing and saw them sweeping by underneath me, standing out clearly against the cloud floor below."*

It was about that time that Watson heard a radio call from the P-40 fight, *"Look at that poor son-of-a-bitch down there with ten of them on his tail!"* It took an instant or two for him to realize that he was, "That poor son-of-a-bitch."

The next pair of German fighters also failed to hit Watson and flashed by his right wing, close aboard. He hauled the nose of his aircraft up and left, then reversed direction to the right. He caught sight of one pair of Me 109s climbing for altitude, another diving on him and another just about ready to drop down on him. At just that instant, another fighter overshot him to his right: *"I could clearly see the pilot's face, pretty well hidden by goggles and helmet, looking at me."*

An instant later, the German's wingman streaked in front of Watson's aircraft and climbed away. In the distance, Watson saw that the P-40 fight—apparently the longest in recorded history—was still ongoing. *"More tracers whizzed by. I jinked left, then right. I kicked the stick forward, banged my head on the canopy, then grabbed the stick by both hands and hauled back, forcing me down on my seatpack so hard I could feel the solid articles within sinking into my buttocks."* A violently moving target was difficult to hit and Watson sought to move his aircraft as violently as possible.

That Watson had survived as long as he had against so many aircraft was improbable. Still, he kept his wits and anticipated the flight paths of his next two attackers. The first one climbed in front of him and Watson started his own aircraft up waiting for the other German. Just as he expected, the enemy wingman arced in a climb just in front of his A-36. *"I relaxed on the stick and began firing my guns just as he came into the line of fire."* Watson's rounds found their mark. *"My bullets started to strike his nose and drifted back along his fuselage as he came higher. Parts began to fly off his plane."* Tracers from another Me 109 flashed past Watson's aircraft and kept him from confirming the destruction of the fighter he had just shot full of holes.



USAAF

The maintenance situation in Italy was often difficult.



Bundesarchiv, Keiner

Me 109s similar to the fighters Watson encountered on April 18, 1944.

He gave his aircraft a boot-full of rudder and spiraled away to the left. His maneuver didn't work. A pair of sharp explosions rattled his aircraft. *"The panes of the canopy were pockmarked with little spots,"* he remembered. Additionally, Watson noted a hole in his left wing and wondered at the damage caused by an explosion that he had felt under his seat.

Still, after the exchange of fire, it seemed that the enemy pilots pressed their attacks less aggressively. Perhaps Watson's shredding of the one Me 109 had tempered their enthusiasm. Noting that the German fighters had become strung out, he raced toward the west, jinking slightly to spoil their aim as they continued increasingly desultory gunnery runs against his damaged aircraft. Finally, he found a deck of clouds and ducked below them to outdistance the Me 109s. At 2,000 feet, with his throttle jammed to the stop, he noted that his airspeed was 315 mph.

At last the Germans gave up the chase. Watson made it safely back to Pomigliano where, unsure of how badly his aircraft had been hit, he executed a wide, safe approach to landing, and then carried a little extra airspeed to ensure that he didn't stall. Once he was safely parked, he crawled out of the cockpit to survey the damage to his A-36. Aside from the hole in his left wing and the pockmarked canopy, he was surprised by what he found on the lower left side of his fuselage. There, an enemy shell had perfectly sheared a line of rivets along a skin joint. The panel subsequently peeled back, leaving a two by four-foot section of the fuselage structure exposed to the elements. The margin between fortune and disaster in the air battles above Europe could be very fine indeed!

That margin had not been enough for the squadron mate that had joined Watson just before the fight had started. The process of elimination revealed that it had been Milan Vukovich. Vukovich was never seen again and presumably was shot down and killed sometime while Watson was fighting for his own life.

Editor's Note: This story was excerpted from Jay A. Stout's book, "The Men Who Killed the Luftwaffe," *Stackpole Books, 2010.*

About the Author: Jay A. Stout is a retired Marine Corps fighter pilot who flew 37 missions during Operation DESERT STORM. An award-winning writer, Smithsonian Air & Space lauded Stout's recent release—Fighter Group: The 352nd Blue Nosed Bastards in World War II—*"This may be the finest book yet written about the air war over Europe during World War II." Stout's tenth book,* Hell's Angels: The True Story of the 303rd Bomb Group in World War II—*will be published in January 2016. Jay resides in San Diego, California with his charming wife, Monica.*



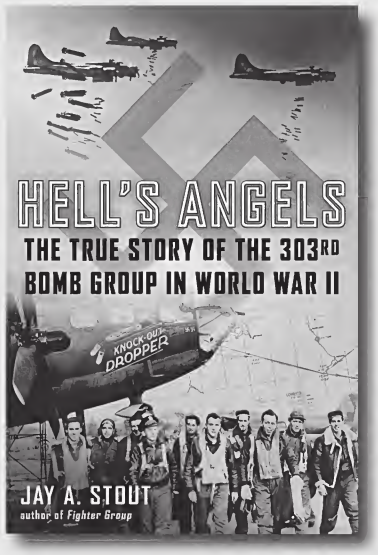
USAAF

Note that, unlike the P-51D, the A-36 mounted twin .50 caliber machine guns just below the propeller spinner.

HELL'S ANGELS

The True Story of the 303rd Bomb Group in World War II

by Jay A. Stout



"Hell's Angels is a gripping and awe-inspiring book"
— Nate Fick, New York Times best selling author

"Jay Stout has done a masterful job…"
— Keith Ferris, famed artist and historian

Berkley Publishing Group
Available at Amazon.com and at your favorite book store.

Remembering My Grandpa, Dutch Kindelberger

by James K. Graham

I have always considered myself to be a lucky guy, and one of the reasons I feel that way, is that I got to be Dutch Kindelberger's grandson. Although I was just 11 years old at the time of his death in 1962, I was able to spend a lot of time with him as a child, since we lived only about 20 minutes away. Dutch (always Dutch, never "Grandpa", by the way) built a house on the bluffs overlooking Santa Monica beach in 1945, and lived there until his passing in 1962, so almost all of my memories of him revolve around activities at that house. He affectionately referred to the house as "Fort Knox", in reference to how much it had cost to build.

I was born in 1951, and got off to a fine start with my name – James Kindelberger Graham – pretty cool, huh? At the time of my birth, my parents lived just a few blocks from Dutch and his second wife, Helen. As a result, it was easy to end up at their house regularly for Sunday night dinners and, even more special, trips with Dutch to exotic spots like the Brentwood Country Mart on San Vicente Boulevard, where he would regularly take me for treats like haircuts and barbequed chicken. As I got older, the Sunday night dinners continued, with the addition of a further incentive to visit – penny a point Gin Rummy with Dutch after dessert, games which he consistently let me win.

Just as he was a special man in his business endeavors, he was an equally special man in terms of family matters. In short, my sisters and I adored him, and enjoyed every minute we spent at his house. If I could use only one word to describe him at that time, it would be, "playful" – he had an innate sense of how to communicate with us as children that made him one of us, not an adult. He may have been an industrialist during the week, but on weekends, he was a grandfather, and he made us feel like there was nowhere he would have rather been, than with us.

We still have a few old 16 mm movies of Dutch horsing around with us, and in all of them, he is over-acting and looking for laughs, which endeared him to us, no end – we couldn't get enough! Dutch loved to work in the garden, loved cameras, loved to cook, and most of all, loved to putter in his workshop. He had a great workshop attached to his house, but separate from the garage, that encompassed about 500 square feet. In it, he had a massive oak workbench, a drill press, band saw, lathe, table saw, and radial arm saw. And that's just the equipment that I remember – there probably was more! In addition, he had a giant rack with about 120 jars of miscellaneous screws and fasteners, which has been replenished several times over the years and resides in my workshop today.

The time that he and I spent in the workshop on Saturdays was magical to a young boy. You would expect that we would have built model airplanes, and today I wish that we would have, but our great works centered mostly around boats and dinosaurs, because those were more important to me as a nine and ten-year-old than airplanes. (Shame on me!)

We knew that Dutch was bigger than life, and not only was his outsized personality a tip off, but there were a few items around the house that indicated his stature in life. These included the small painting of him in the hall with an F-86 and a MiG that was on the cover of TIME magazine in 1953, his nickel slot machine in a cabinet off the living room (complete and utter contraband for a small boy), and the bar by which all bars should be measured, semi-circular and leather covered – oh, wow!

Dutch was an inveterate tinkerer, and not only held dozens of aircraft patents, but, as a hobby, also developed and patented an equal number of household gadgets that never made it to anybody else's household. Things like slicers, drink mixers,



James Kindelberger Graham family archives

Dutch Kindelberger's home atop the bluffs in Pacific Palisades overlooking Santa Monica beach. With an innate sense of humor, he nicknamed the house "Fort Knox" as a facetious reference to its building costs.



Dutch and his grandson, Jimmy, enjoying some gardening.

electrical appliances, and my favorite, the legendary (in our family, anyway) potty trainer named "Kindelberger's Kunning Little Kiddy Krapper." Who knew?

In 1959, I was attending in West L.A. what was known then as a summer "day camp", a place where my mom could drop me for most of the day, and get relief so she could have some time to run errands or have time for herself. One particular day, which I'll never forget, there was a great big bus parked in front of the facility, and all of us children were herded into it upon our arrival at camp – we were going on a field trip! After all the kids were present and accounted for, we got under way and were wondering where we were headed. Shortly thereafter, our counselor stood up and announced that we were headed for the Los Angeles airport, where, courtesy of Jimmy Graham's grandfather, we were going to be hosted on a tour of an aircraft plant. Wow! Not only was I instantly a celebrity, but we were the luckiest kids ever, because that's exactly what we did – toured the line building F-100s, I believe, followed by hot dogs and ice cream, plus a visit from Dutch.



James Kindelberger Graham family archives

Dutch Kindelberger and grandson Jimmy at the North American plant with Prince Bernhard of the Netherlands, who was a big customer of North American and Lockheed, until he was exposed in later life as having taken bribes from Lockheed at some point. But that's another story… still a great photo!

That level of thoughtfulness exemplifies Dutch, and demonstrates what I mentioned earlier: his playfulness and ability to communicate on the level of small children, just as he did with generals and test pilots. Today, I am a grandfather myself, and the inspiration for how I approach my granddaughters comes directly from how Dutch treated me and my sisters – there was nobody more important, and always enough time to hear what we had to say, or do what we wanted to do. What a great legacy, and a great example to follow.

About the Author: Jim Graham resides in southern Orange County with his charming wife, Jenene. Inspired by his grandfather's unparalleled success in engineering, he entered USC as a Mechanical Engineering major, only to be redirected by his professors a few semesters later into financing and marketing. He has been an auto dealer for the last thirty years.



Dutch enjoying a quiet moment at his home, "Fort Knox", located above the Pacific Palisades.



Boeing archives photo courtesy of John Fredrickson

Dutch Kindelberger's roots as an hourly steel mill worker is evident as he relates with two workers in resolving an issue at the NAA Kansas City B-25 production factory during World War II.

Lance Missile Powered by Rocketdyne

by Jim Bates

The U.S. Army's Lance was a surface-to-surface missile capable of delivering accurate long-range artillery support at a division level with nuclear or conventional warheads. The 20.5 ft long, highly mobile missile was first delivered to the field in 1972, and was deployed in key area around the world through 1992.

The Lance featured an innovative guidance system that imposed very unique and demanding requirements on its rocket propulsion system. The storable liquid propellant engine that met these requirements was designed, developed and produced by North American Aviation's Rocketdyne Division, with over 3,300 units manufactured from 1970 to 1980.

The Lance led to a number of highly significant Rocketdyne programs based on storable propellants—Peacekeeper Stage IV, numerous space program applications for NASA, and kinetic energy weapon developments, such as THAAD.

I was one of four Rocketdyners at the White Sands Missile Range for the first flight test of the Lance Missile in March 1965. Witnessing the takeoff for the first time was incredible! At 15 g, the Lance seemed to disappear instantaneously from its launcher and was out of sight in the blink of an eye, leaving behind its signature corkscrew of black smoke. The flight ended downrange exactly where it was supposed. It was a big event for the Army, for Ling-Temco-Vought (LTV) and for Rocketdyne.

Lance was the name the Army selected in late 1962 for a missile known earlier only as "Missile B." In 1960, the Army was studying four weapon systems: Missiles A, B, C and D. Missile B eventually survived the Army's studies and was to be the subject of a major industry competition. It was to be a surface-to-surface missile (SSM) capable of conveying a 1,000-lb warhead 75 km. Rocketdyne began to evaluate the challenges of providing the very unique propulsion for Missile B.



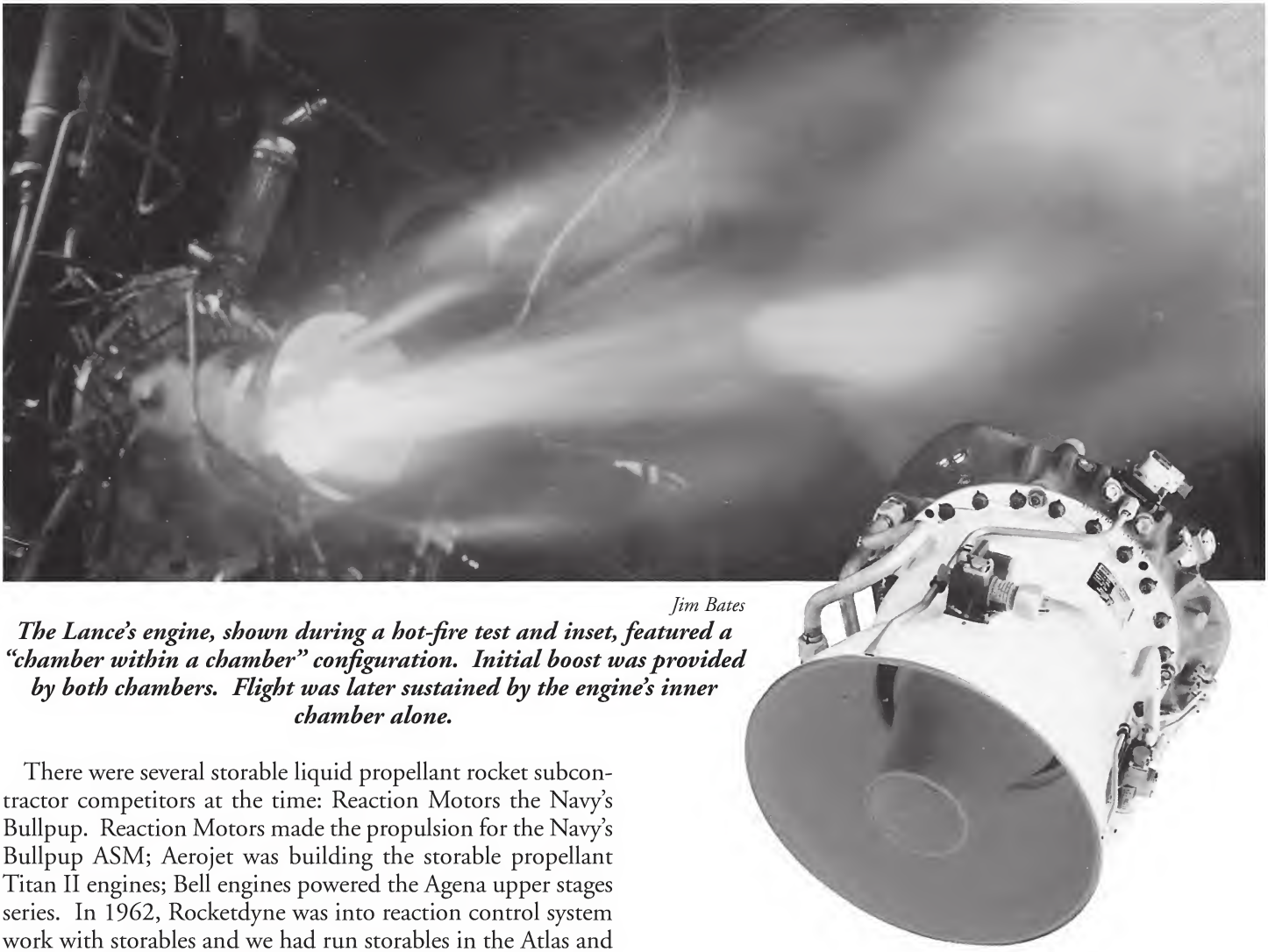
Jim Bates

A Lance missile and transport trailer are airlifted to a field site by a CH-47 Chinook helicopter, where the missile could be set up and launched within minutes.

Missile B was unique in that it was based on a very simple and inexpensive guidance system called "Autonet." The basic idea was to boost the missile at high acceleration to a velocity based on the desired range and trajectory. Then the thrust would be greatly reduced and controlled so that thrust was always equal to the missile's drag as it completed its trajectory. When this zero-g condition prevails, the velocity is held constant and the missile automatically compensates for atmospheric conditions, allowing the guidance system to be very simple, rugged, accurate and cheap.

However, adoption of such a guidance system puts a great demand on the propulsion system. High thrust is required for initial boost, plus the boost duration must be controllable. Then a much lower thrust is required during the zero-g sustainer phase of the flight. And since the air density—and, therefore, vehicle drag—changes while the missile ascends and descends in its trajectory, the sustainer thrust must be able to vary accordingly—or "throttle"—over a wide range. Only a liquid propellant system could handle these requirements, and the propellants would have to be storable to meet field requirements. And since most of the flight would be in zero-g conditions, the liquid propellants had to be positively displaced—the liquids could not be allowed to "float" in their tanks.

In early 1962, the Army Missile Command (MICOM) issued a request for proposal to candidate prime contractors for the R&D and production phases. Rocketdyne's capture team now began to pick up speed since it now appeared that there really would be Missile B development and production programs and that the propulsion system contract would be extremely significant. We submitted proposals to Martin and to LTV. Chrysler was a third prime competitor.



Jim Bates

The Lance's engine, shown during a hot-fire test and inset, featured a "chamber within a chamber" configuration. Initial boost was provided by both chambers. Flight was later sustained by the engine's inner chamber alone.

There were several storable liquid propellant rocket subcontractor competitors at the time: Reaction Motors the Navy's Bullpup. Reaction Motors made the propulsion for the Navy's Bullpup ASM; Aerojet was building the storable propellant Titan II engines; Bell engines powered the Agena upper stages series. In 1962, Rocketdyne was into reaction control system work with storables and we had run storables in the Atlas and Thor engines designed for LOX-RP. We also had a legacy of earlier North American Aviation experience (prior to Rocketdyne's existence beginning in 1955) in making small air-to-air missile propulsion systems.

We had a big technological nugget going for us: the wide throttling range required for the Missile B sustainer phase is anathema to rocket engines (which are by nature steady-state machines). However, Rocketdyne had invented a deep-throttling injector. We built this injector at near-scale for Missile B and began testing it on Independent Research and Development funds. The injector worked extremely well, throttling to near shutoff conditions. This demonstrated technology was Rocketdyne's ace-in-the-hole.

We originally proposed to build the entire propulsion system, including tanks, positive displacement devices, pressurization system, thrust chamber assembly and the thrust vector control system—in effect, everything from the missile guidance section to the boat tail closure. The aft tank bulkhead and injector were combined; the engine could not be separated from the tankage. It was designed this way to save overall length and weight. Later on, the tankage and engine would be separate assemblies, per customer direction.

We were selected by LTV to be their Missile B propulsion system contractor. The system proposed to LTV would be 20 inches in diameter, 10 feet long and weighed 1,630 lb when loaded with inhibited red fuming nitric acid (IRFNA) and unsymmetrical dimethylhydrazine (UDMH). It would produce a maximum sea level thrust of 56,400 lb and could produce a minimum thrust of less than 100 lb—a ratio of over 500:1. Positive expulsion of the propellants would be ensured by lightweight aluminum pistons in each aluminum tank. Pressurization was provided by a solid propellant gas generator, controlled by a large hot-gas valve that vented excess solid propellant gases overboard.

To provide the enormous throttling capability needed, a small thrust chamber assembly (sustainer) would be mounted within and concentric to a larger thrust chamber assembly (booster). The sustainer would feature an injector based on the IR&D work, controlled by fuel pressure, and which could continuously throttle from a nominal 4,150 lb thrust to minimum of 71 lb. The annular booster would produce 52,250 lb of thrust for up to 5 sec, with cutoff controlled by squib-actuated boost termination valves. Initial Missile B (propulsion plus guidance plus warhead) acceleration would be over 17 g! Thrust vector control during boost phase would be produced by four valves equally-spaced around the booster nozzle, controlling fuel injection into the expanding supersonic booster combustion products—the first full-scale application of this means of thrust vector control. Missile B could operate at temperatures between -40 °F and +140 °F, could be stored for at least 10 years, and could survive a 20 ft drop in any attitude! What we were proposing was a propulsion system that could do everything but talk.

MICOM now downselected to two prime contractor competitors: LTV and Chrysler. The winner would be determined on the evaluation of final proposals to be submitted by the two primes, with competing proposals for the design, development and production of the Missile B weapon system.

Teamed with LTV, we went to their plant in Grand Prairie, Texas, to prepare the proposal. We were to stay during the entire proposal preparation period, which turned out to be two (very long!) months. Our tiny team began to attract notice in the huge LTV complex. For one thing, we had become inured to fatigue and worked constantly, day and night, arousing emotions of either admiration or pity in our LTV associates.

At this juncture, the Army decided that Missile B would be called "Lance," and the distinctive logo was adopted. It was also decided that the missile should have a "production break": that is, the propellant feed system and engine system were to be individual assemblies, capable of being built separately, then easily joined. Providing this capability added weight and length, but was required for procurement flexibility. This was a major design change. In subsequent years, LTV manufactured the propellant feed system, while Rocketdyne manufactured the engine assembly.

Other changes included an increase in missile diameter from 20 to 22 inches and a decrease in thrust from 56,400 to 44,000 lb. It was also determined that the spin torque imparted by the aerodynamic fins would be insufficient at the low velocity immediately after launch, so we devised a tangential exhaust from the solid propellant hot gas valve, giving the Lance its unusual "corkscrew "of smoke as it leaves the launcher.

After the proposals were submitted, the Army requested oral presentations by LTV AND Chrysler at MICOM in Huntsville. Our Lance team was all just flat wore out by this time, but not quite so wore out that we couldn't celebrate when LTV—and Rocketdyne—was selected. Rocketdyne was placed under letter contract in January 1963, and the R&D program was expedited.

After component and subsystem test successes, we tested the full-up propulsion system. The success of those tests at the Santa Susana Field Lab signaled the delivery of our first propulsion system for the initial flight test at White Sands Missile Range in New Mexico.

After the highly successful first flight, we began working on increasing system reliability through the continuing development program. There were problems along the way, not too surprising with such a sophisticated propulsion system. During this phase the "production break" requirement was exercised, and LTV assumed responsibility for the propellant feed system and Rocketdyne for the engine.

Rocketdyne was requested to significantly increase engine performance, because the Army wanted to greatly extend the Lance maximum range capability, allowing it to replace two other SSM systems. Our approach was to focus on a new, higher-performing booster injector. Our initial approach had been to make the annular booster injector as cheaply as possible, depending on a splash plate to help in atomization and mixing. The additional performance being sought required a higher-performing booster injector, and the splash plate configuration did not have that potential. On the basis



Jim Bates

The Lance takes flight from a mobile launching platform. The dark tangental exhausts from the solid propellant hot gas valve gave the missile a stabilizing spin during the missile's flight.

of sub-scale hot-fire tests we proceeded with the design of an interchangeable engine featuring the higher-performing booster injector. This injector verified the sub-scale tests and did provide the desired range of 125 km.

When I left the program in late 1966, Lance flight tests were going well, and the new injector was incorporated into all production Lances. Preparation was under way at LTV to produce the feed system and at Rocketdyne to produce the engine. The result was a production run that would finally see better than 3,300 Rocketdyne engines come off the line to equip Lances at U.S. Army field locations all over the world.

About the Author: Jim retired from Rocketdyne in 1993 as Director of Propulsion Systems Engineering with 38 years of service. After retirement, he incorporated a small business selling Beech Bonanza airplanes where his charming wife, Ginna, served as VP, Treasurer and CFO. They have resided in Porter Ranch, California for the past 32 years.

Test Drive the Aviation Art *of* William S. Phillips

In addition to the painting on the cover of this issue, *A Bandit Goes Down,* Phillips' P-51 fine art editions include:



Victory Pass



The Long Ride Home



Among the Columns of Thor

Former Navy combat artist and award winning painter William S. Phillips has spent decades painting flight from the Wright brothers to today's fire-fighting helicopters for the Los Angeles Fire Department. His WWII paintings were featured in a one-man show of his work at Smithsonian's Air and Space Museum.

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Contrails from the Past

by Ed Rusinek

Dear NAA Retirees,

My name is Michael Bainer. I had the honor and privilege to fly the B-1B at Ellsworth AFB located at Rapid City, SD in the late 1980s and early 1990s. Words fall far short in describing the thrill I got flying such a fantastic machine. During my tenure, we certified the aircraft over snow, ice and water at 200 ft AGL. We also were the first unit, the 37th BMS, to fly night IMC low level (200 ft AGL) in the clouds – a real live testament to modern engineering for sure. At advanced flying competitions such as Red Flag, Maple Flag, Copper Flag and over water exercises vs. the USN, we defeated the World's best on a regular basis. Simply stated, the aggressors could not track, turn on, and catch us in time to defeat us!

One of the real highlights of my B-1 experience was the 1991 Dayton Air Show. Our arrival demo included high-speed passes below 200 ft well in excess of 500 KIAS. The real pleasure for me came when I was able to share the aircraft with NAA/Rockwell folks from Columbus and GE folks from Cincy who designed and built this marvelous machine. MANY wept openly, seeing it for the first time ever. As an Ohio Native, it was my pleasure to show them all that I could since the cockpit was still classified.

They all just could not get over how beautiful and powerful the machine had to be and I assured them that I had no doubts about its wartime capabilities.

As a young boy growing up in the shadows of Wright Field and the Wright brothers, flying machines dominated my imagination. I flew in a Ford Tri-Motor over Lake Erie for a penny a pound and I received change back from a dollar.

Please accept my humble and most sincere CONGRATULATIONS on designing and building the most advanced flying machines – May GOD BLESS Each and Every One of You – and May GOD BLESS AMERICA!

— Mike Bainer, Campbellsville, KY

Ed's Resp.: Wow! Wow, Mike! Can we ask you to represent us at the United States Air Force Academy in our pursuit of a black granite NAA Memorial Bench on their campus. Thank you for this splendid and totally unexpected commentary on another of our successful programs. Perhaps the folks over at the Academy have been around Turkeys too long and can't recognize an Eagle.

Dear Ed,

I read the Bulletin from "Cover to Cover" the day it arrives. My job at NAA kept my three children and I "out of the weather" and fed, clothed and schooled them. I am so very glad to have worked there for 25 years.

Thank you for your work on the Bulletin. Enclosed is a small token of my appreciation.

— Leba J. Whipple, Centralia, WA

Ed's Resp.: Thank you for kind words about the Company and your generous contribution to the Bulletin. You are one of the ladies that came to NAA a little later but you filled a very important role in the success of the Company. You typed the letters, performed thousands of calculations on your Friden calculators for the engineers, strung out and installed electrical harnesses in the aircraft and finally became supervisors and members of Management. Bravo Leba!

Dear Ed,

I have been following the "demise" of the Space Division buildings on Lakewood Blvd. for the last decade. When the Downey Studios main building was demolished, I was surprised that these buildings weren't included. It appeared to me that they were being "saved" for future use.

Signs at the location indicate a mall is being constructed – called the Promenade at Downey. I found a brochure detailing the construction, including a site plan map and the three original Vultee/Space Division buildings are to be incorporated into the Mall design.

— Les Katow, Los Angeles, CA

Ed's Resp.: As time passes, all evidence of what transpired at this small industrial site will disappear. As they drive by to shop at the Mall, no one will even remember, much less know, that from this small industrial site men dreamt and then built vehicles that allowed mankind to leave this earthly sphere, enter outer space and then to safely return to this planet.

Dear Ed,

I remember in January 1954, I was at Nellis AFB, NV, like it was yesterday. It was my first flight in the F-86. As soon as I broke ground, I knew I was in for a Cadillac experience.

Breaking the Sound Barrier was in one way forgettable. At 40,000 feet, I rolled inverted, pulled through to a vertical dive, watched the Mach Meter register 1.03, reduced the throttle to idle, popped the speed brakes and leveled off. The sensation in the cockpit was that nothing unusual had occurred. No big deal today, but that was 1954!

Sixty-one years later, the F-86 remains a classic design. Our first swept wing fighter participates every year in the heritage flight at Venture/Oshkosh. I can't tell you how proud I am when I watch my first operational aircraft still performing.

I earned my wings training in the T-6, T-28 and the T-33. The F-86 was by far the easiest to fly. One example: Fuel Management was as simple as being alert for the fuel gauge reaching a 900 pound "bingo."

The built-in redundancies offered a sense of safety that our enemies at the time ignored in their aircraft designs. I'm so very fortunate to have flown the F-86. Moreover, I have the greatest respect for those who conceived, designed tested and produced such a superior weapons platform. It was the reason the U.S. held air superiority over South Korea.

— J. Howard Shellhaus, Lexington, KY

Ed's Resp.: Wow, Howard! Would you mind telling your splendid Saga to a bunch of Colonels at the USAF Academy that we want to install a black granite North American Aviation bench at the Academy to memorialize our fantastic company rather than to aggrandize ourselves?



J. Howard Shellhaus photo

Four "birds" on the Alert Pad at the end of Runway 36 at K-13, Suwon, South Kores. Circa 1954.



J. Howard Shellhaus photo

An F-86 over Mt. Fuji, Japan. I flew the airplane with my knees to get this shot. Circa 1955.

Congratulations and Best Wishes to

David and Eileen Herold of San Marcos, California
celebrating their 68th Wedding Anniversary

Patrick and Mary Jane Hanifin of Anaheim, California
celebrating their 63rd Wedding Anniversary

John and Vivian Andres of Seymour, Tennessee
celebrating their 62nd Wedding Anniversary

William and Lilah Santo of Westerville, Ohio
celebrating their 60th Wedding Anniversary

I asked the Lord in heaven above,
to help me find someone to love.
A caring person, loyal and true...
He heard my prayer and sent me you.

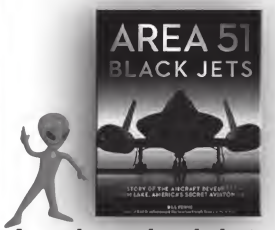
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Prefer to reserve a table? Organize a group of 4 to 8 and order tickets in one check

The Silent Majority

by Stan Guzy

COLLINS, JOE W., 84 – of Anaheim, CA, passed away on June 5, 2015. Joe joined NAA in 1956 in Procurement on the Minuteman, Apollo/Saturn and Space Shuttle programs. In 1984, he moved to Subcontract Administration and was Manager of the Avionics Section for the B-1B, C-130, OV-10 and X-31 projects. Joe retired with 41 years of service and is survived by his loving wife of 60 years, Maureen.

DOUGLAS, WARREN S., 74 – of Chino Valley, AZ, passed away on September 30, 2015. After service in the U.S. Navy, Warren joined NAA/Rockwell in 1962 as an electronics technician and rose through the technical ranks to retire from Boeing as a divisional director with 37 years of service. He was proudest of his service on the Apollo and Star Wars programs. He is survived by his wife, Marsha.

GOVEN, RICHARD C., COL. USAF (RET) – passed away in Colorado Springs, CO on September 28, 2015. After a distinguished career in the USAF, Dick retired in 1983 and, subsequently, served as Manager of Advanced Program Pricing at North American Aircraft at El Segundo, CA.

HARRIS, JOHN D., 86 – of Whittier, CA, died on November 9, 2015. John served in Quality Control at Space Division on the Apollo and PINCH programs. He then transferred to the Sabreliner Corporation and retired in 1990 with 38 years of service. He is survived by his wife, Kathel.

HOVE, MELVIN C., 77 – passed away at home in Huntington Beach, CA on November 26, 2015. Mel was a Reliability engineer at Space Division on the Apollo and Space Shuttle programs. Mel was a gentle soul who loved his God, his country, his family and his friends. He retired in 1996 with 35 years of service. He is survived by his loving wife of 56 years, Donna.

JONES, WALTER C., 91 – of Blue Jay, CA, died on October 9, 2015. After service with the Army, Walt came to LAD and served for 39 years, retiring in 1981. He was one of the early volunteers on the NAA Retirees Bulletin staff.

KIRKPATRICK, JIM – of Salinas, CA. Bulletin returned, stamped "DECEASED."

SHUSTER, IRVING, 94 – a lifelong resident of Bexley, OH, passed away on October 9, 2015. Born in Romania, he immigrated to America in 1935. Graduating from City College of New York in 1943, he joined Curtiss-Wright as an engineer and, subsequently, NAA Columbus Division in 1950. Irving served in the Structures Lab until 1985, retiring with 35 years of service.

SMITH, HARRY C., 91 – died peacefully in Culver City, CA on September 3, 2015. Returning from the Army Air Corps as a pilot, Harry obtained his degree from Mississippi State College and joined NAA as a wind tunnel engineer. He retired in 1989 with 41 years of service. He is survived by his loving wife of 44 years Betty.

SQUIRES, RONALD A., 88 – of Yorba Linda, CA, passed away on November 16, 2015. Ron was a project planner at Autonetics. He retired in 1985 with 30 years of service. He is survived by his wife of 70 years, Shirley. She is also a NAA retiree.

THATCHER, WILLIAM E., 84 – of Fullerton, CA, passed away on November 14, 2015. Graduating from UCLA in 1954, he came to Space Division and was recognized as a computer expert when most people didn't even know what a computer was. He retired in 1990 as an Engineering Administrator. He is survived by his wife of 63 years, Barbara.

ZEPADA, JOE, 80 – passed away on September 20, 2015 in Long Beach, CA. Joe was hired by Douglas-Long Beach as a novice tool designer on the DC-8. Laid off three years later, he worked at Aerojet as a draftsman for six years. Joining NAA, he worked on Apollo, Skylab, GPS, Shuttle and other projects. Joe worked on the tiles (TPS) for the first Space Shuttle that included working at KSC. He retired from Boeing in 2001 at Palmdale.

LOST SHEEP, BULLETIN RETURNED WITH NO FORWARDING ADDRESS

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JAMES ALBAUGH – SEATTLE, WA

NORMAN C. BUCHERT – MERRITT ISLAND, FL

JAMES J. DAVIS – COEUR D'ALENE, ID

JOHN H. DUN – HUNTSVILLE, AL

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Stan Guzy is still sidelined with medical issues and may not be back for several months. Please include him in your prayers! Also, if your address label has "December 2015" above your name, please renew your subscription now.

NORTH AMERICAN AVIATION
RETIREES BULLETIN
P.O. Box 3797
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North American Aviation Retirees Bulletin
"Where The Best Never Rest"

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IF THE DATE ABOVE YOUR NAME IS DECEMBER 2015 AND YOU HAVEN'T YET RENEWED –
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"Destination Germany" printed with permission of the Artist

Because of heavy losses sustained by the lack of fighter aircraft able to accompany bombers deep into Nazi-occupied Europe, the 8th Air Force contemplated abandoning daylight bombing. With the introduction of the long-range North American Aviation P-51 Mustang, the Luftwaffe became the hunted. In his painting "Destination Germany" renowned British aviation artist Ronald Wong portrays two fuel-laden P-51Ds of the 55th FS taking off from their airfield in East Anglia to join hundreds of other P-51s on a bomber escort mission.

NORTH AMERICAN AVIATION
Retirees Bulletin
"Where The Best Never Rest"

Spring 2016

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Anthony Taylor photo

Former NASA Astronaut Robert "Hoot" Gibson banks the racing-modified P-51 Mustang "Strega" in a tight pylon turn on the second lap of the 2015 Unlimited Class Gold race at the National Championship Air Races in Reno, Nevada.

NORTH AMERICAN AVIATION
Retirees Bulletin

North American Aviation Retirees Bulletin, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAA Retirees Bulletin can be contacted at The Boeing Company, Seal Beach facility by phone at (562) 797-3836. Send mail to:

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Dear NAA Retirees Bulletin Subscriber

Here we are! Starting our 17th year of publication! It's hard to believe that we have come this far with the same team of volunteers that started with us in 1999 when Boeing gave us the boot! However, time has taken its toll. Of the five original volunteer staff, there are only two of us still standing! Of course we have received a tremendous boost from Boeing Historian Mike Lombardi; his newest volunteer, John Fredrickson; our expert on contracts from Ohio, Nolan Leatherman and our greatest living resource, Larry Korb! This year I am 89—I still don't know what we are going to do when I get old!

We are still being stonewalled by the ever vigilant guards of the sanctity of the Air Force Academy in our quest to place a black granite North American Aviation memorial bench on their campus grounds. Yet, I would bet that at least one of them is alive today because his father was one of the B-17 or B-24 pilots during World War II saved from the deadly fire of the Luftwaffe by an escorting North American Aviation P-51—**THE ONLY AIRPLANE CAPABLE OF ESCORTING THE BOMBERS ALL THE WAY TO TARGET AND BACK!**

Of course, it is easy to understand their dilemma. Whoever heard of a company that ceased to exist 50 years ago and is still having a retirees group putting up black granite memorial benches, endowing scholarship awards and publishing a slick quarterly publication like the North American Aviation Retirees Bulletin.

In this issue, we asked historian and publisher Larry Davis to provide us a follow-up story on "Gabby" Gabreski serving in Korea, flying the North American F-86 against the Russian-Chinese-North Korean pilots flying in the MiG-15. Reaching into his vast library of photos and articles from that conflict he came up with this recount about this Ace of two wars flying two totally different types of aircraft.

Our good friend Chuck Lowry bumped into Astronaut "Hoot" Gibson at an airport and in the ensuing conversation asked if he would favor us with an article. Although on a very tight schedule, Captain Gibson agreed. Hence, his article on racing souped up, slimmed down P-51 airplanes at the Reno Air Races. Some of the photos in color were so great, we almost went for the entire issue to be printed in color but our budget told us an emphatic "NO."

In 1943, with World War II at its hottest, the United States Army Air Forces issued an innocuous informal request to aircraft manufacturers to lay the groundwork for the development of a large multi-jet engine bomber. Business savvy "Dutch" Kindelberger immediately recognized the potential for North American Aviation in the future with the jet-powered aircraft. Our own NAA author, Erik Simonsen, provides us a splendid article on the B-45 Tornado.

The article about the Two John Moores has been on my mind for a long time. It wasn't because of their accomplishments or technical prowess within the company but rather because of their strong sense of balance and self-control under very harsh and severe conditions that drew my attention to them.

The commentary, *"Betrayal in Benghazi"* by Colonel Phil Handley, was forwarded to us by an old friend and reader, himself a former USAF pilot. Colonel Handley completed a 26-year career flying a variety of aircraft including the F-86 Sabre, F-15 Eagle and the C-130 Hercules. He flew 275 combat missions in Southeast Asia in the F-4D and F-4E. His awards include 21 Air Medals, 3 Distinguished Flying Crosses and a Silver Star.

We apologize for the lateness in the delivery of this issue but we, again, had to mail out reminder cards for the several hundred that forgot to renew their subscriptions. From this, we learned that dozens of readers are beyond our reach! May they all be assigned to the Angel Wing Design Department! God Bless them all!

"Gabby" Gabreski Serving in Korea

by Larry Davis

Editor's Note: Francis "Gabby" Gabreski, the son of Polish immigrants operating a meat market in Oil City, Pennsylvania was attending Notre Dame University with unimpressive grades. Angered by the German invasion of Poland, he enlisted in the U.S. Army Air Corps and was assigned as a fighter pilot to the 45th Pursuit Squadron of the 15th Pursuit Group at Wheeler Field in Hawaii. Although he managed to get airborne in his Curtiss P-36 Hawk on the morning of December 7th 1941, it was too late to intercept the departing Japanese.

At this time, Polish pilots flying in the Royal Air Force were defending Britain with great success. Gabreski requested a transfer to England to fly with the Poles and to learn their techniques. He was posted to No. 315 RAF (Polish) Squadron stationed at RAF Northolt.

Flying the new Supermarine Spitfire Mark IX, the Poles taught him to remain calm during a mission, to maintain four-man element formations rather than the riskier RAF three-man element, to fly head on into the German formations to break them up into singular melees, to close to within 50 meters of the targets and use snapshooting while constantly changing position in flight. In all, Gabreski flew twenty missions with the Poles and engaged the enemy once.

In February 1943, Gabreski was transferred to the 56th Fighter Group, 61st Fighter Squadron flying Republic P-47 Thunderbolts and was quickly assigned as a flight leader. Loud and verbose, he was resented by many of his fellow pilots. In May, the group was moved to RAF Halsworth and sent into combat. On August 24, 1943 he scored his first kill. Surviving several close calls, his score grew until July 5, 1944 when he became the leading ace in the ETO with 28 destroyed in the air and 3 on the ground.



Larry Davis photo collection

Lt. Col. Francis "Gabby" Gabreski leans on the wing of his 4th Fighter-Interceptor Group F-86A at Suwon AB, Korea in Summer 1951. Gabby shot down 3 MiG-15s during his assignment with the 4th FIG.

Born Francis Stanley Gabreski on 28 January 1919 in Oil City, PA, he was naturally nicknamed "Gabby" in school. Soon after graduation, Gabby joined the U.S. Army Reserves in July 1940, and served as a Flying Cadet at Maxwell Field. He graduated Flight School in March 1941 and was commissioned a 2nd Lieutenant. Now a Captain, Gabby was transferred to the fledgling 56th Fighter Group, 61st Fighter Squadron in England. It was during this time that Gabby became the top-scoring pilot in the ETO, shooting down a total of 28 air-to-air victories, with 3 more destroyed on the ground, over the vaunted German Luftwaffe. But his luck ran out during a strafing run into Germany and he crashed on a German airfield on 20 July 1944. He remained a prisoner of the Germans until the end of the war.

After the end of World War II, he went to Wright Field as a test pilot. After being released from the active Army Air Force in 1946, Gabby joined the California Air Guard where he served as a pilot until 1947 when he was recalled to active duty, this time in the new U.S. Air Force. He was promoted to Lt. Colonel, commanding the 55th Fighter Squadron at Shaw AFB, South Carolina. In 1949, he returned to his old outfit, the 56th Fighter Group, now equipped with F-80 jet aircraft, at Selfridge Field, Michigan, where he remained until July 1951.

It was at this time that he again began a second combat tour and a long history with North American Aviation products. In July 1951, he landed at a forsaken airfield in the middle of a war in Korea. The base was Suwon AB, and the unit was the 4th Fighter-Interceptor Group, whose job it was to wrest control of the skies from the Communist MiG-15s. At this, Gabby would prove to be equally as effective as he had been in Europe six years prior. He was named Deputy Wing Commander.

On 8 August 1951, Gabby got his first MiG kill, when he jumped several MiGs after being released from escort duty with the B-29s. His radio call sign was "Dig Mike Lead." *"Jakeman"* (the B-29 force commander), *"This is Dig Mike Lead. I have you clear of the area and we'd like to return to the target and help Filter"* (an F-51 unit that had MiGs in the area). Jakeman released the Sabres, who promptly returned to Pyongyang where the MiGs were.

"Dig Mike flight, drop your tanks!" The flight of Sabres suddenly increased their speed to near Mach 1, climbing to over 30,000 feet. Suddenly, Gabby nosed over and started down. Gabby saw something and started firing. No one else in the flight saw it. But there it was, a single MiG-15, and Gabby had him in his sights. He lit the MiG up from



Larry Davis photo collection

***The ramp at Suwon AB is filled with 4th FIG F-86A Sabres in Summer 1951. Among the three F-86s parked underneath camouflage netting, the closest aircraft is Lt. Col. Gabreski's F-86 Sabre, also named* "Gabby."**

wingtip to fuselage. But he was going too fast and overshot the MiG. The MiG rolled inverted and started toward the deck. But Gabby wasn't done yet. He saw what we thought was another MiG way down low. Closing to 1,500 feet, he opened fire again and saw pieces of the tail fly off. The MiG continued on until it crashed near the Taedong River. When they landed, Gabby was asked, *"Was that two?"* He exclaimed, *"No! It was the same MiG!"*

That was #1. There would be two more before Col. Gabreski was transferred to the F-80 equipped 51st Fighter Group in October at Suwon. The 4th Wing had moved north to Kimpo AB near Seoul. The 51st was transitioning into brand new F-86E Sabres. And Gabby would take over as Commander. He rapidly got the veteran F-80 pilots transitioned into the much faster F-86E and began flying missions with the 4th into MiG Alley, on the Yalu River.

After a particularly aggressive fight in 1952, Gabby made the following comments; *"The Red's planes are better, their pilots are better, and their system is better. Whoever is flying these MiGs is using some of the old German Luftwaffe tricks. They* (the Red pilots which we now know were actually Russians) *are as good as any German pilots I met in the last war."*

Gabby said the MiG pilots are using some of the same tactics the Germans used against American bombers. *"It looks as if they're practicing for bombers. These MiG pilots know their business. You expect a new pilot to break away when two jets come racing at each other head-on. But these guys come straight at you, firing away."*

In speaking on the MiG-Sabre comparison, Gabby remarked; *"As far as I'm concerned, the F-86F has all the better [capabilities] in any combat with a MiG-15 – late or early model. The MiG does have a slight advantage in ceiling and climb over the Sabre. But these are more than offset by the adverse flight characteristics of the MiG, and the much finer gun system, combat maneuverability, and equipment in the F-86. The best pilots in the world couldn't win with inferior equipment, just as the best equipment in the world couldn't win with inferior pilots and training. I think our great kill ratio over the MiG is due to a healthy combination of both."*



Larry Davis photo collection

Col. Gabreski signs aircraft forms on the wing of his F-86 at Suwon AB following a dogfight in MiG Alley in 1952. The 51st Wing was equipped with the newer and faster F-86E Sabres at this time.



Larry Davis photo collection

Major Bill Wescott (left) and Captain Ivan Kinchloe (right) with Col. Gabreski after he shot down his 5th MiG. All three pilots were aces in the 51st Wing in Korea.



Larry Davis photo collection

Col. Gabreski's personal F-86E Sabre, s/n 51-2740, with the 51st Wing was nicknamed "Gabby" and carried his famous cigar on the nose.



Larry Davis photo collection

Colonel Gabreski during a visit to the North American Aviation plant at Inglewood in 1953.

On 1 April 1952, Gabby Gabreski became one of a small handful of pilots to become an ace in two wars. He shot down his 5th MiG on that day to bring his total to 5½. (He shared a MiG with another pilot on 12 February.) He would add one more MiG victory and a Damage to bring his total to 6½ MiGs in Korea. That took his overall total for two wars to 34½ over the best in the Luftwaffe and the Russians in Korea.

Col. Gabreski left Korea in June 1952, and went on to command several units in the Air Force. He retired from the Air Force in October 1967. After a stint at Grumman as Director of Public Relations, he became president of the Long Island Railroad. Gabby died on 31 January 2002.

About the Author: Larry Davis served with the City of Canton, Ohio Fire Department for 39 years. In recognition of his firefighting service, he was named Firefighter of the Year in both 1980 and 1998. Mr. Davis pursued a couple of other careers including being a full time author with Squadron-Signal Publications and Specialty Press. He was also president of HR Davis Candy Company. Invited to become Editor of SabreJet Classics, the media publication of the F-86 Sabre Pilots Association, he is a leading author/historian on the air war over the skies of Korea.



Larry Davis photo collection

Col. Gabreski climbs aboard a new F-86E Sabre at North American Aviation's Inglewood plant in 1951. The Inglewood plant built all the F-86A and E Sabres, except for the Canadair-built F-86E-6s that the USAF bought in 1952.

Racing the Mustang

by Robert "Hoot" Gibson

I've raced the Unlimited Class at the Reno Air Races nearly every year, starting in 1998 when I was invited to race a Hawker Sea Fury named *"Riff Raff."* This was a new airplane to the races and we had a long learning curve in getting the airplane up to speed, much of which had to do with simply getting the rated horsepower from the R-3350 Wright Cyclone that replaced the Bristol Centaurus found in a stock Sea Fury. The nuances of water-methanol injection, regulators, water spray bars for the oil cooler meant there was much to overcome. We finally made our way into the Unlimited Gold Final, the fastest 8 aircraft in 2002 and from thereon raced in the Gold Final most of the remaining years we raced *Riff Raff* which ended in 2009.

I was asked to race another Sea Fury in 2011, which had previously raced under the name *"September Fury"* but was now known simply by its race number, *"232."* I flew *232* in 2011 through 2014 and its best showing was in 2012 when I finished second overall in the Gold Final. Unfortunately, the other 3 years of racing ended with a blown engine each time. In the meantime, I set a speed record for Sea Furies when I qualified at 480.249 mph in 2013. After replacing the engine 3 out of the 4 years, the owner has had enough and the airplane is for sale.

Since my days of racing Sea Furies was at an end I was invited to race the fastest Mustang ever to race at Reno, Bill "Tiger" Destefani's highly modified P-51 *"Strega"* (*"Witch"* in Italian). This airplane had won the Unlimited Gold Championship more than any other racer in history with 10 wins at Reno, 7 of them by Tiger himself. Needless to say, I was totally excited by the opportunity and set about to learn all I could about Mustangs in general and *Strega* in particular. The first order of business was to acquire a Type Rating for the P-51 since I had flown Mustangs many years ago but had not done a checkout and received the necessary rating. So it was off to Kissimmee, Florida to my good friend Lee Lauderbach and *"Stallion 51"* to train. Lee is one of the absolute BEST instructors I have ever known in addition to being a close friend for over 20 years. He managed to fit it all into his busy schedule and I passed my checkride and now had the rating to fly *Strega*.



Robert L. Gibson photo collection

Hoot Gibson in Hawker Sea Fury, race 232, in which he set a speed record for the Sea Fury at 480.249 mph.

I was able to spend some time at Shafter, California and got acquainted with *"The Witch"* by flying multiple sorties and learning the very different systems in the airplane. *Strega* has been totally modified to be a racer and has some systems not found in a stock Mustang.

From the photos it can be seen that the wings have been clipped, the canopy replaced with a small racing bubble, and the radiator air scoop has been greatly reduced in size and inlet area. All these features significantly reduce the overall drag and contribute to the "thoroughbred" nature of the airplane. The reduced radiator air scoop necessitates a water spray bar system to enable the engine to stay within coolant temperature limits.

I initially flew *Strega* with a stock engine in place which was the standard Rolls-Royce Merlin but the week before the races we had our race Merlin in the airplane and I got acquainted with it prior to the flight from Shafter to Reno. The race engine used an increased gear ratio to the supercharger and several other modifications to greatly increase the amount of power we would be producing for racing. The engine utilized water-methanol injection to operate at very high manifold pressures



Robert L. Gibson photo collection

Author Robert "Hoot" Gibson in the Hawker Sea Fury* "Riff Raff" *edges out the P-51 Mustang* "Cloud Dancer" *at the National Championship Air Races, also known as the Reno Air Races.



Robert L. Gibson photo collection

Lee Lauderbach and Hoot Gibson stand before Stallion 51's two-seat Mustang,* "Crazy Horse" *at Kissimmee, Florida. There Hoot trained to receive his Type Rating for the P-51.



Robert L. Gibson photo collection

The streamlined contours of a racing-modified P-51 Mustang are evident in this photo as Hoot Gibson flies* "Strega" *above California's Central Valley in preparation for the Unlimited Class race in Reno, Nevada.

and had a valve in the cockpit on the instrument panel for me to operate to keep the induction temperature at the "sweet spot" of 85° C. In spite of working to get time on the engine in addition to time on the test cell, we only had a total of 5 flights on the engine prior to the flight across the mountains to Reno, all of which went fine. Once in place at Reno, it was time for numerous briefings and practice on the racecourse and finally into qualifying runs. I flew a short practice flight on the course on Sunday, September 13th and then did a qualifying run on September 14th at 80 to 100 inches of manifold pressure which was the first time the engine had been run at more than takeoff power. This produced a relatively slow speed of around 430 mph around the course. The serious qualifying run was made on September 16th and resulted in a speed of 475.043 mph, second overall behind the Grumman F8F Bearcat, *"Rare Bear"* piloted by Stewart Dawson. I suspect the race Merlin was still coming up to power and so ran in the Friday heat race on September 18th finishing second to *Rare Bear*.

It was in the Saturday heat race that *The Witch* really came to life. After starting the race in second place behind Stewart in *Rare Bear*, he and I went wide in the first set of pylons and Steven Hinton wasted no time in passing both of us in *"Voodoo"* which is a much-modified Mustang very similar to *Strega*. I was therefore sitting in a very unsatisfactory Third Place. From that point on, *The Witch* came alive and successively picked off *Rare Bear* and then *Voodoo* to win the heat race, which put me "On The Pole" for the Gold Final race on Sunday, September 20th.

For the Gold Unlimited Final, I ran full throttle on that Rolls-Royce Merlin which gave me 128 inches of manifold pressure at 3,400 rpm! The estimated horsepower was about 3,000 hp and really propelled the airplane around the course achieving a first lap speed of slightly over 503 mph! I was never seriously threatened for the lead and steadily left the rest of the field behind over the 8-lap race.

The crew chief, L.D. Hughes, called me for the first power reduction to 125 inches about half way through the race since I was far enough ahead, and then to 120 inches, and finally 110 inches to finish up the race. Even though I was powering back as the race progressed, I still finished at the second fast-



Robert L. Gibson photo collection

Hoot Gibson learns* Strega's *flying characteristics on a practice flight above Shafter Airport in California.

est average speed ever for the Unlimited Gold Final Race at 488.983 mph. This was the fastest speed flown on the newer racecourse that was shortened after the races in 2011. With this win, *Strega* has won the Gold 11 times and I became the 21st person to have won the Unlimited Championship since the races began in 1964. After 18 years of air racing, it has been a tremendous thrill for me to win this, the high point of Unlimited Air racing!

It takes a dedicated team and the people in the final photo are some of those who worked the long hours tirelessly to put the airplane together each day for the races that resulted in the final victory for 2015. The flight home over the mountains went without incident, even running that same engine I had pushed so very hard in the races! It's a real tribute to the P-51 Mustang and the mighty Rolls-Royce Merlin to be still winning the Crown of Air Racing, The Unlimited Gold Championship.

About the Author: Captain Robert L. "Hoot" Gibson, USN Retired, served as a Navy Aviator, Test Pilot, and NASA Astronaut, and as a Pilot for Southwest Airlines. He flew five missions aboard the Space Shuttles—as Pilot on Challenger *on mission STS-41-B, and as Mission Commander on* Columbia *on mission STS-61-C,* Atlantis *on mission STS-27,* Endeavour *on mission STS-47, and again on* Atlantis *on mission STS-71. He also served as NASA's Chief of the Astronaut Office and as Deputy Director, Flight Crew Operations. He has been air racing over the space of 18 years, participating in the Formula 1 Class, the Jet Class, and the Unlimited Class.*



Robert L. Gibson photo collection

Hoot Gibson holds the Unlimited Class Gold Championship Permanent Trophy.



Robert L. Gibson photo collection

Hoot Gibson and the members of the Strega Team savor their victory at the Awards Presentation upon winning the Unlimited Class Gold Final at the 2015 National Championship Air Races.

The North American Aviation B-45 Tornado

by Erik Simonsen

It all began with an informal United States Army Air Forces (USAAF) request issued to aircraft manufacturers in June 1943 that set the groundwork for the development of a large multi-jet engine bomber. After reviewing the responses, with increased confidence, the Air Materiel Command (AMC) issued more specific requirements on 17 November 1944. Post-World War II requirements for the medium bomber called for a minimum of four engines, aircraft weight between 80,000 and 200,000 pounds, and a bomb load of 8,000-22,000 pounds – depending on mission combat radius. Additionally, a cruising speed of 450 mph, top speed of 550 mph, range of 3,500 miles, and a service ceiling of 45,000 feet were stipulated. Based on the performance of interceptors at the time, the defensive armament would consist of Emerson Electric radar-directed twin .50 cal. machine guns or 20 mm cannons mounted in the tail. The AAF concluded that because of its speed, the new jet bomber could only be intercepted from its six-o'clock position.

Four major aircraft contractors responded with their respective aircraft configurations – The Boeing Company, Consolidated-Vultee (later Convair), Glenn L. Martin Company and North American Aviation (NAA). Lockheed deferred on this competition, and focused its resources on a new jet fighter. Northrop also declined to compete, and continued to invest in heavy bomber designs with a flying wing configuration. Subsequently, the following aircraft designations were assigned, NAA XB-45, Convair XB-46, Boeing XB-47 and Martin XB-48.

Preplanning Expertise

Business savvy NAA Chairman and President Dutch Kindelberger was cognizant of how eager the AAF was to have a jet-powered bomber in service as soon as possible. His passion and attitude prevailed, and this had a tremendous impact on the development of NAA's next aircraft. Precisely when the war ended was not a factor, since Kindelberger was confident that jet-powered aircraft was the future for NAA. Essentially, NAA had been working on new bomber design studies since 1943. By January 1944, Kindelberger had actually discussed progress on future concepts with the AAF. NAA had developed the piston-powered XB-28 (NA-63) which was a larger and more advanced follow-on to the famed B-25 Mitchell medium bomber. The XB-28 was not authorized for production, and only two prototypes were built and tested. Nevertheless, demonstrating the basic design proved useful, and the propulsion could be switched to jets. In turn, the AAF's leadership was well aware of NAA's dependable reputation for aircraft production rates, and innovative assembly processes that were supporting the war effort.

Under the direct leadership of NAA Vice President Lee Atwood, design work on a new medium bomber commenced. The new configuration eventually evolved into Model NA-130, and incorporated some of the basic structural configuration of the XB-28, but with aerodynamically designed nacelles each housing two jet engines. By July 1943 the mockup was approved and the XB-45 moved into detailed production design.



Boeing Archive illustration

Artist concept of the North American Aviation B-45 Tornado.

A Twist of Fate

An unusual twist in the medium bomber competition took place, when AAF evaluation officers reached several early decisions prior to any of the competing prototypes being flown. Their studies concluded that the four-engine Convair XB-46 was inferior to the NAA four-engine XB-45, mainly due to its increased weight combined with the thrust limits of current jet engines. However, a single XB-46 prototype was authorized to be completed for flight testing purposes. Convair had elected to defer its funding for a second XB-46 prototype to initiate other concept studies. Meanwhile, the six-engine competitors, the Boeing XB-47 and Martin XB-48 would proceed with assembly of their prototypes. Additionally, because of its extensive preliminary work, NAA was awarded a contract for three XB-45 experimental prototypes on 5 February 1946. With the Cold War heating up, critical procurement decisions were accelerated, and on 30 October 1946 NAA was awarded a production contract for 96 B-45A Tornados (NA-147). The AAF required a medium jet bomber quickly, and NAA was the contractor in the best position to expedite the job.

NAA's design would feature four engines mounted integral with and below the wings. Each Allison-built General Electric J35 would provide 4,000 pounds of thrust. This configuration was a basic laminar flow straight-wing design with a span of 89 feet. The landing gear was a traditional tricycle landing gear arrangement, consisting of a nose wheel with the main landing gear retracting into the engine nacelles. Engineers increased the dihedral of the horizontal stabilizer to keep its leading edge surfaces out of the hot engine exhaust. The XB-45's wings were thick enough to allow for internal self-sealing fuel tanks capable of holding 3,400 gallons. The B-45 design also provided for 600-gallon wingtip tanks, plus drop tanks mounted below the engine nacelles to further increase range beyond its average of 1,800 miles.

The XB-45 would have a crew of three in a pressurized environment, with the pilot and copilot located in a clear fixed-canopy – NAA opted for this feature to simplify the pressurization system. The navigator/bombardier was located in the lower forward fuselage. Similar to the Boeing B-29's arrangement, the bomb bay and aft section were not pressurized. In the operational bomber, the tail gunner's compartment for the forth crewman would be pressurized. The B-45B was designated to have a radar-directed tail gun assembly operated from the forward section. The system was tested and proved unsuccessful – thus, the "B" variant never entered production, and NAA moved onto the B-45C that retained the manned tail gunner's station. An abundant amount of captured World War II swept-wing aeronautical data, collected under Operation LUSTY (Luftwaffe Secret Technology), was disseminated among all the major U.S. aircraft manufacturers. Subsequently, NAA engineers translated and studied the data. However, the engineering team concluded that the XB-45 was too far along in development to make the switch to a swept-wing configuration. NAA executives had determined that keeping the XB-45 on schedule was paramount, and the new swept-wing data would be directed toward NAA's XP-86. Since work on the XP-86 jet fighter program was under way at NAA's Englewood facility, only the three XB-45 experimental prototypes would be built there. Additional factory space at Douglas Aircraft in Long Beach, California was leased for B-45A production.

The Tornado Flies First

To avoid the XB-45 from being viewed from the adjacent Los Angeles Airport, the Number One XB-45 prototype (t/n 559479) was disassembled, and transported overland the 105 miles to Muroc (now Edwards AFB) for its first flight. On 17 March 1947 the XB-45 with engineering test pilots George Krebs and copilot Paul Brewer aboard, took to the air. Because of previously known landing gear door lock problems, the gear was not retracted during the flight. This required the speed to be limited to no more than 230 mph. The rational for this was that even though new landing gear door locks were available, they had not yet been installed on the prototype. NAA felt that keeping the first flight on schedule was more important than achieving a higher speed on the first flight. The speed objective could be easily reached later.

During the flight debriefing, the pilots reported a smooth flying aircraft with no major anomalies. Several squawks were noted, including a problematic pressurization system that required the crew to wear oxygen masks. A primary reason for the fixed-canopy was to improve cockpit pressurization. Another item brought to the attention of the engineering team was the sluggish hydraulic flight controls. The good news for NAA was that none of these issues were "show stoppers" and basically the XB-45 flew very well. By mid-April 1948, XB-45 Number One had accumulated 120 flights, and a top speed of 516 mph had been attained. After a total of 135 flights were accumulated, the Number One aircraft was flown to the Douglas plant in Long Beach, California and temporarily stored. On 3 August it was flown to Muroc for installation of the uprated General Electric J47 engines, each capable of delivering 5,200 pounds of thrust. After additional flight testing with the J47s by both NAA and Air Force pilots, the first prototype was accepted by the USAF on 31 April 1948. In a long line of "NAA firsts" the B-45 became the first operational multi-engine jet bomber in the USAF. The second prototype (t/n 559480) had initiated test flights on 10 December 1947. After completion of 44 flight hours, and a J47 retrofit, the second prototype was also accepted by the USAF on 27 July 1948.



Boeing Archive photo

The North American Aviation XB-45 Tornado is flown on its maiden flight on 17 March 1947 with its landing gear unretracted due to known problems with the gear doors.



USAF photo

Trailing black smoke produced by early jet engines, an NAA B-45A Tornado (t/n 7073) begins a test flight.

Tragedy at Muroc

On 20 September 1948, during a test flight of the Number One prototype out of Muroc, George Krebs initiated a high-speed diving maneuver to test the load factor of the aircraft. As the aircraft accelerated, a sudden explosive force ripped off part of the right nacelle. The debris entered the slipstream and part of the horizontal stabilizer was hit and separated from the aircraft. As the XB-45 departed controlled flight, the wings sheared off and George Krebs and Nick Piccard were killed in the resulting crash. The accident investigation team determined that an insulation lining inside the engine nacelle was frayed, and had loosened during the recent J47 engine installation. Gradually, as flight time was accumulated, the insulation near the exhaust nozzle became flammable, and a minor fuel leak ignited it. Another aspect of the investigation brought to light a design fault of having a fixed canopy, and not a movable canopy with cockpit ejection seats for quick emergency egress. The fixed canopy simplified the pressurization system, but proved disastrous during an inflight emergency. Under high-g forces, the crew was unable to move quickly enough to the lower exit hatch to bail out.

Engineers redesigned the fixed canopy to an aft-moving canopy. The pilot and copilot were also equipped with ejection seats in the remaining two prototypes. Subsequent B-45A production models included ejection seats, a redesigned nose panel; increased horizontal stabilizer wing area; bomb bay modifications to carry three types of nuclear weapons, or auxiliary fuel tanks; drop tank hard points under the engine nacelles; and the large single nose gear wheel switched to smaller dual wheels.



USAF photo

B-45As from the 47th Bomb Wing parked on the Langley AFB, Virginia flight line. The photo was taken in July 1952, prior to the 47th BW departing for RAF Sculthorpe, England.

Lesson Number One – Maintain a Strong Defense

A B-45A Tornado participated in the politically significant Congressional Air Show at Andrews AFB, Maryland, that was held on 15 February 1949. President Harry Truman attended and personally toured the latest USAF fighters and bombers – aerial demonstrations were also conducted for the VIP audience. Although the flight line was impressive, in reality the USAF had no depth. The post-World War II draconian budget cuts were ongoing, and the number of up to date aircraft in the inventory was dismal. At the time, no one would have imagined that just over a year later, the RB-45C would be pressed into a combat reconnaissance role in the Korean War.

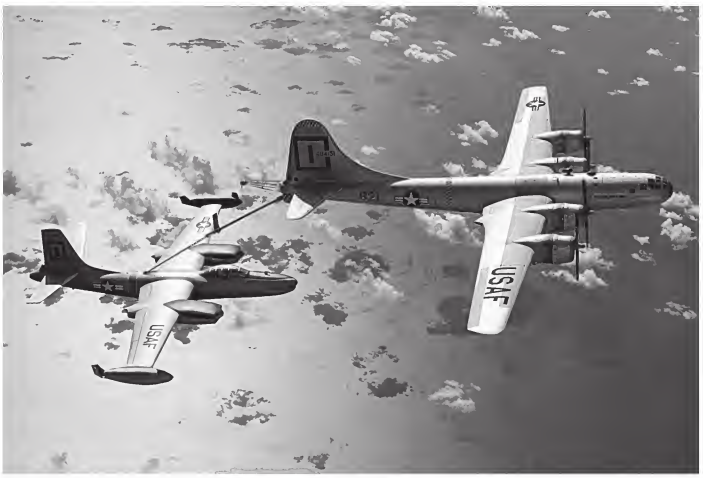
Evidently, the Pentagon's negative flow budget activity was being closely monitored by the Soviet Union and China. They were keenly aware of the drastic drawdowns conducted by the U.S. and its European Allies following World War II. Its continued slide fit nicely with planned Communist global ambitions. This implied U.S. strategic weakness was an open door. With backing from the Soviet Union and China, their surrogate North Korea was unleashed. On 25 June 1950, hostilities broke out on the Korean peninsula as North Korea invaded South Korea. When North Korea needed further assistance, China intervened with its own army. Our former World War II ally the Soviet Union assisted with advisors and military hardware, including the latest MiG-15 jet fighters – many flown by Soviet pilots. The U.S. and its Allies were completely caught by surprise. Once again, a long-standing lesson to have a top intelligence system in place, and also maintain a strong military was ignored. Unfortunately, mistakes of this nature cost lives.

The Korean War evolved into a United Nations effort to repel the North Korean and later, Chinese troops from the south. To bolster the United Nations and Allies situational awareness, in September 1950 three RB-45C reconnaissance variants were deployed to Yokota AB, Japan to carry out optical/radar photographic missions over the Korean peninsula, Manchuria and Chinese coastal areas.

Mission Possible

The Boeing-developed aerial refueling boom in 1948 was a critical enhancement for the new jet bombers and fighters. In 1949 the first aerial tankers introduced were B-29 bombers modified into a KB-29M variant, followed by the KB-29P with a rigid support mount above the boom. Subsequently, B-45s and RB-45Cs in service were equipped with receptacles to receive fuel from the new flying boom. By the end of 1950 there were 129 KB-29P tankers in service. During Korean War reconnaissance sorties, the RB-45Cs were harassed by MiG-15s – one aircraft was shot down on 4 December 1950, and another was seriously damaged the following spring. The RB-45Cs were temporally withdrawn from flying daylight missions. With all-black paint schemes, the RB-45Cs returned to flying night sorties from December 1952 to April 1953 – their contrails hopefully obscured by the night sky. They successfully obtained radar images of numerous Chinese targets.

During this Cold War time period, the RB-45C was also conducting classified missions over Soviet territory to collect intelligence. Close ally, Great Britain was extremely worried about increasing communist aggression worldwide. In 1951, President Truman and British Prime Minister Clement Atlee



Photo/illustration by Erik Simonsen

A USAF/NAA RB-45C Tornado reconnaissance variant being refueled by a KB-29P tanker. Modified from a B-29 bomber, the Boeing-developed refueling boom was critical in extending the range of the B-45C/RB-45C fleet. In 1952 an RB-45C flew from Elmendorf AFB, Alaska to Yokota AB, Japan with two air-to-air refuelings. The non-stop transpacific 4,000-mile flight earned the NAA RB-45C, the 1952 MacKay Trophy "most meritorious flight."

reached an agreement to have RB-45Cs operate from an RAF base. In March 1952, four RB-45Cs from the 91st Strategic Reconnaissance Wing (SRW) were transferred to RAF Sculthorpe at Norfolk in eastern England – the aircraft were subsequently painted in RAF markings. With inflight refueling, this location brought Soviet targets of interest within range. The special high altitude missions were flown by RAF aircrews that had been trained in the U.S. On 17-18 April 1952 three RB-45Cs entered denied airspace near Murmansk, Belorussia toward Moscow, and the third in a southern route over the Ukraine. The aircraft obtained radar imagery of key targets, and managed to escape the anti-aircraft fire and interceptors. The extensive "electronic ears" of U.S. Signal Intelligence (SIGINT) installations recorded the Soviet defensive response for future war planning.

By the end of 1948, the competing straight-winged Convair XB-46 and Martin XB-48 had been eliminated, and the Boeing XB-47 was awarded the medium bomber contract. Boeing had opted to halt its original design work and switch to a swept-wing for the XB-47. Subsequently, as the more advanced B-47 was phased into the SAC fleet, the B-45s were gradually relegated to ancillary tasks such as, target towing (TB-45C) and as inflight engine testbeds. Although the B-45C bomber variant never dropped a conventional bomb during a conflict, it was the first multi-engine jet to airdrop a nuclear device during testing. In all, a total of 143 of the first operational multi-engine jet bomber were built. This included the three XB-45 prototypes, 97 B-45As, ten long range B-45Cs, and 33 converted strategic reconnaissance RB-45Cs. The NAA B-45 was unique in the fact that it had been ordered into production prior to the medium bomber competition reaching full-steam. It was ready when needed, but would not out perform the swept-wing XB-47. The B-45 Tornado served with the USAF until its retirement in 1972.

About the Author: An avid aviation photographer since the 1960s, Erik has been documenting various types of military, commercial, business and sports aviation subjects. Honing his skills acquired from a graphics, fine arts and astronomy background, his hobby turned into a professional endeavor. Blending aviation and space imagery with manipulated background colors, he developed early special effects techniques for commercial advertising. With the onset of the digital age, Erik now works with his wife, Sharon, who excels in Photoshop techniques. His most recent aviation history book, Project Terminated, *has recently been released and is available at bookstores everywhere. Erik and Sharon reside in Chino Hills, California.*



Photo/Illustration by Erik Simonsen

After approval by President Harry Truman and British Prime Minister Clement Atlee, a covert overflight of the Soviet Union dubbed "Special Duty Flight" was launched. In early 1952, four USAF RB-45Cs were transferred to RAF Sculthorpe and painted in RAF markings. In the preceding months, British aircrews had been trained in the U.S. to fly the Tornado. On April 17-18 1952, three RB-45Cs departed to perform high altitude missions over three separate Soviet targets simultaneously.



Photo/illustration by Erik Simonsen

A USAF RB-45C (t/n 8027) painted flat black in an attempt to foil more powerful searchlights being employed by North Korean anti-aircraft sites. If contrails appeared during daylight sorties an abort was called. During night reconnaissance missions over denied airspace, standard-marked RB-45Cs were being tracked by the searchlights, with or without contrails.

The Two Men Named John Moore

by Ed Rusinek

Editor's Note: One of the advantages of being an editor is that sometimes you are given a chance to glimpse into the hearts of your authors. Such was the case when I asked John Moore, the President of Autonetics and John Moore, the Test Pilot at the Columbus facility and the Apollo Test Operations Manager at KSC to write articles about their experiences at NAA. Both men were no longer with the Company when I made these requests. President John Moore immediately agreed and offered to explain how NAA was swindled by Slick Al. Test pilot John Moore was undergoing medical treatment and was too weak to do any writing but offered the use of any chapter out of his autobiography that he had recently published.



Test Pilot John Moore was stationed aboard the aircraft carrier *USS Essex* during the Korean War flying Grumman F9F Panther jets. He was sitting down, eating his Sunday night dinner when he was ordered to the flight deck to help move several airplanes because a damaged McDonnell F2H Banshee was making an emergency landing and the airplanes had to be moved to make room. He rushed out to the flight deck without even minimal protective clothing, jumped into a cockpit and moved the airplane to the starboard side of the ship and parked it with the tail overhanging the very edge of the flight deck.

The Banshee touched down on the flight deck, failed to engage the arresting cable, bounced over the crash barrier and smashed into the plane with John still aboard. He felt the heat from the ensuing explosion and realized the plane was going over the side and into the ocean. He popped up to the surface alongside the moving carrier. His face and hands were so horribly burned, he could not be touched. A rescue helicopter appeared and he was pulled aboard by the seat of his pants. He underwent months of surgeries and recuperation before leaving the Navy.

Another Naval combat pilot, Jim Pearce, was the head of Flight Test at NAA Columbus, and he hired John as a test pilot. When Jim moved to KSC to head up the NAA Apollo operation, John went along as Apollo Test Operations Manager. After the Apollo 1 fire, both men were requested to resign to provide the NASA some scapegoats!

John opened a very successful business in Cocoa Beach and was elected Mayor of Cocoa Beach. Unfortunately, at that time he contracted prostate cancer and was undergoing extensive treatment when I called him about the article.



John Moore, the Autonetics President, had served in the high technology industry since 1937. He joined NAA in 1948 and rose to become President of Autonetics in 1960. With the merger, John became head of the entire NAA segment. Holder of 25 patents, he served on seven DoD Committees and had received nine major achievement awards from various technical organizations. After the Rockwell takeover of North American Rockwell, he and other original NAA members of management were forced out. It proved that the original merger of the two companies was only a Trojan Horse to gain control of the entire company. John provided the Bulletin a detailed report of how NAA grew in achievements until the merger and then was shattered by the takeover.

I maintained social contact with the two Moores long after their articles appeared in the Bulletin. During one phone conversation with John Moore, the Test Pilot, I asked him if he had ever met John Moore from Autonetics. He replied, *"No, I never have. I would attend symposiums and technical meetings and the word would go out 'John Moore is here' and people would come to me until they found out I wasn't The John Moore of Autonetics, I would have liked to have met the man!"*

In a subsequent call, a nurse answered his phone and informed me that John was dying and it was only a matter of weeks. I immediately called John of Autonetics and explained to him the conversation I had with the other John. Ever the Patrician, he replied without hesitation, *"Give me his phone number."* He immediately called John and they had a quiet 40-minute conversation which ended with John of Autonetics telling the other John, *"You know, I have heard so much about you. I always wanted to meet you."* Two weeks later, John died from overexposure to too much radiation used as a cure for his prostate cancer.

He is buried at Arlington with all the other American heroes.

The Autonetics' John Moore's wife was a heavy smoker and she died prematurely of consumption. John implemented a Study at UCLA Medical Center, enlisting a major pharmaceutical company, which resulted in the establishment of a new department at UCLA dedicated to finding a cure. To hasten progress, he volunteered his own body to serve as a human guinea pig for testing experimental medications.

There you have it! Two men, same name! Yet with different backgrounds! With different experiences! With different values! With different objectives! With different hearts! Yet, really, were they so different?

A COMPLETE HISTORY OF U.S. COMBAT AIRCRAFT

Fly-Off Competitions

by Erik Simonsen



Foreword by former USAF historian Dr. Richard Hallian.

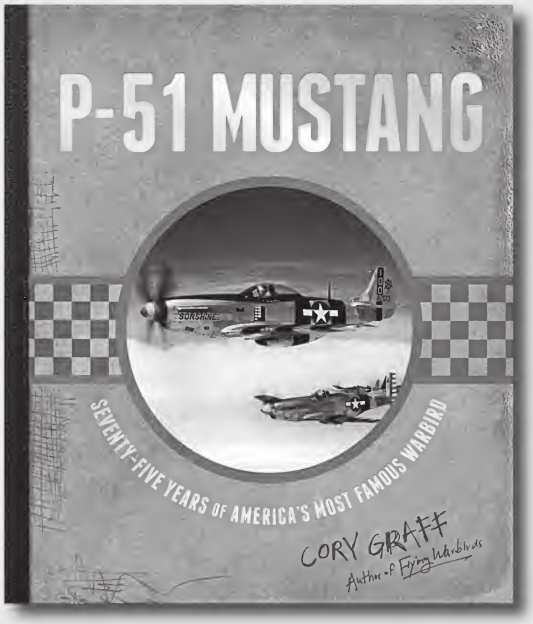
Fly-Off contains ten chapters of well-known fighter/bomber competitions, and explains in detail how fly-off competitions are conducted, it shows the reader what both competing aircraft designs looked like during their trials, and then what the losing aircraft would have looked like in operational markings had it actually won. Author Erik Simonsen uses the wonders of modern digital photography to create highly believable images of aviation's most tantalizing "might have beens."

Hardcover, 228 pages
Available June 2016
Pre-orders at Specialtypress.com or Amazon.com.

P-51 MUSTANG

Seventy-Five Years of America's Most Famous Warbird

by Cory Graff



Celebrate 75 years of the iconic World War II warbird that helped win the war and flew into the heart of American life.

"Cory Graff's latest book is gorgeous from cover to cover beginning with the embossed as well as artistically laid out front cover. P-51 Mustang continues between the covers with historical and current photos of Mustangs during their service history through the Korean War as well as today. Graff's writing tells the tale of Mustang variants and service history though not too technically and spiced with anecdotes from posters to model kits – just enough for demonstrating how deep in Americana the Mustang has become."

— Seattle Post-Intelligencer Blog Travel for Aircraft

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GO FOR ORBIT

by Astronaut Rhea Seddon

In a small town in Tennessee, the young girl stood with her father and gazed at the Russian Sputnik in the night sky. She knew that she was witnessing the beginning of a new era for the human race. Would she play a part? Rhea Seddon was ten years old.

As years went by, humans ventured off the planet and walked on the moon. The astronauts were men but she felt that would change. At Berkeley in the tumultuous late 1960s, in medical school and a surgery residency she learned that the world no longer belonged solely to males. When NASA announced a selection of new astronauts for the space shuttle program in 1977, she knew: this was her chance.

As one of the first female astronauts in 1978 her quest for space began. But she would do this job her own way, blazing a new path for others to follow. Venturing into space on three spectacular missions, working on important projects for NASA, weathering the storm of Challenger, marrying a fellow astronaut, and bearing Astrotots, that child who looked skyward long ago is an inspiration to all who aim high to find their own orbit.

Congratulations and Best Wishes to

James and Geraldine Haywood of Franklin, Tennessee
celebrating their 71st Wedding Anniversary

Charles and Roberta Day of Mesa, Arizona
celebrating their 69th Wedding Anniversary

Jean and Betty Burrell of Sonora, California
celebrating their 68th Wedding Anniversary

Frank and Reva Chudoba of Van Nuys, California
celebrating their 66th Wedding Anniversary

George and Joan Whited of Columbus, Ohio
celebrating their 62nd Wedding Anniversary

Richard and Gloria Stephenson of Crestline, California
celebrating their 60th Wedding Anniversary

Don and Carol Ornellas of Fullerton, California
celebrating their 55th Wedding Anniversary

Contrails from the Past

by Ed Rusinek

Dear Ed,

Please extend my subscription for another two years, God willing.

I have thoroughly enjoyed all the articles so far and am looking forward to the next two years. I also want to congratulate you and your editorial team on its drive to establish an NAA memorial bench at all the appropriate locations and I join the many readers who share your frustration at the refusal to adopt one, of all places, by the USAF Academy!

— Cesar (Frank) De Barro, San Juan Capistrano, CA

Ed's Resp.: Don't judge the people at the USAF Academy too harshly! They are only normal people and they assume that we are the same. The folks at Boeing that dumped us sixteen years ago with no warning, no funding and no help were all normal people too. What they did not recognize is that once you joined the North American Aviation family, you realized that everything is possible if you never accept failure! That is why "Where the Best Never Rest" is our motto!

Dear Ed,

I am 101 years old and I live alone in a mobile home park. I maintain a scrapbook about all the NAA products and events.

— Clyde E. Maulding, Valley Center, CA

Ed's Resp.: Well, God Bless you, Clyde! Keep moving, make it hard for the Devil to find you! Let's hear from you at 102!

Dear Ed,

Once, every three months, my world stops when the Bulletin hits my mailbox! Please renew my subscription for another year of reading pleasure. I left Northrop Aircraft in 1962 to work on the S-II

Pressurization Systems design and then on to JSC in 1967 to join the S-II Launch Team. From there, it was Shuttle Assurance Management, ending in Shuttle Logistics in June 2000.

— James Stone, Merritt Island, FL

Ed's Resp.: Outsiders often ask me why we knock ourselves out publishing the Bulletin, the Company is Dead! The Company is not Dead as long as we have people like you with the flame of having participated in opening a whole New Frontier-Space-burning in your gut! We only regret that our weak-brained politicians dropped the whole effort and became spectators as the rest of the world moves on into this whole new world of progress and development!

IT IS HARD TO SOAR WITH THE EAGLES WHEN YOU ARE SURROUNDED BY SO MANY TURKEYS!

Dear Ed,

February 1, 2016 marks the 55th anniversary of the first launch of the Minuteman I ICBM from Cape Canaveral, FL. In an unheard of and unprecedented plan, it was an all-up 3-stage flight of over 4,000 miles to a broad ocean test range. All systems performed as planned and the accuracy was within specs. The powered boost lasted about three minutes and the acceleration was in the neighborhood of 11 g when the G&C computer blew the thrust termination ports on the 3rd stage engine to free the re-entry vehicle on its ballistic path. We on the program, who had committed two years earlier to a first flight before the end of 1960, preferred to identify the date as December 63rd, 1960! The first four launches of Minuteman from Cape Canaveral were from above ground pads. After that, all launches were from in-ground silos.

The Air Force approach to the G&C system was new and totally different than the approach which had been taken on earlier ICBM developments. The G&C system was to be comprised of everything electrical, electronic or hydraulic downstage from the re-entry vehicle, including the electrical and hydraulic power and all the downstage cabling. And it encompassed the thrust-vector-control hydraulic actuators on each of the four nozzles of the three engine stages. It even included the structural section of the missile which housed the stable platform, the digital computer, the power system and other elements of the G&C system. A major factor in selecting Autonetics as the G&C contractor was the broad array of incredible talent which Autonetics President John R. Moore had assembled under one roof. Boeing was selected as the ICBM integration contractor. As part of its integration task, Boeing provided an instrumentation wafer for the R&D flights which included the Autonetics instrumentation for the G&C system.

In operational deployment by SAC, Minuteman I was an outstanding success. The G&C system attained a Mean-Time-Between-Failure (MTBF) of considerably more than a year of unattended (in-silo) 27/7 operation in a 30-second launch alert. And, it met and exceeded its accuracy goals. By all counts, it was the most cost-effective strategic weapon system of all. It was followed by the successful Minuteman II, Minuteman III and Peacekeeper Programs.

— Robert V. Knox, Sun City West, AZ

Ed's Resp.: Where have you been all these years? You make a fantastic reporter! Thank you for this splendid report!

Dear Ed,

Thank you again for a great job you do in publishing this Bulletin of Memories. My husband, Tom, and I read each one. He represented and negotiated the contracts for NAA. After his passing, I still love reading them. Keep up the good work!

— Karen Collacott, Westminster, CA

Ed's Resp.: Whenever we get discouraged by the growing number of Retirees we lose to the Silent Majority, we get a note from someone like you, Karen, and it gives us that extra "LIFT." May God's Light shine on you!

Betrayal in Benghazi

by Phil Handley, Colonel, USAF (Ret.)

The combat code of the U.S. Military is that we don't abandon our dead or wounded on the battlefield. In U.S. Air Force lingo, fighter pilots don't run off and leave their wingmen. If one of our own is shot down, still alive and not yet in enemy captivity, we will either come to get him or die trying. Among America's fighting forces, the calm, sure knowledge, that such an irrevocable bond exists is priceless. Along with individual faith and personal grit, it is a sacred trust that has often sustained hope in the face of terribly long odds.

The disgraceful abandonment of our Ambassador and those brave ex-SEALs who fought to their deaths to save others in that compound is nothing short of dereliction of duty. Additionally, the patently absurd cover-up scenario that was fabricated in the aftermath was an outright lie in an attempt to shield the President and the Secretary of State from responsibility.

It has been twelve months since the attack on our compound in Benghazi. The White House strategy, with the aid of a "lap dog" press, has been to run out the clock before the truth is forthcoming. The testimonies of the three "whistle blowers" have reopened the subject and, hopefully, will lead to exposure and disgrace of those responsible for this embarrassing debacle. It would appear that the most recent firewall which the Administration is counting on is the contention "that there were simply no military assets that could be brought to bear in time to make a difference" mainly due to the unavailability of tanker support for fighter aircraft.

This is simply BS, regardless of how many supposed "experts" the Administration trots out to make such an assertion. The bottom line is that even if the closest asset capable of response was halfway around the world, you don't just sit on your penguin ass and do nothing.

The fact is that the closest asset was not halfway around the world, but as near as Aviano Air Base, Italy where two squadrons of F-16Cs are based.

Consider the following scenario (all times Benghazi local): When Hicken Tripoli received a call at 9:40 PM from Ambassador Stevens informing him, *"Greg, we are under attack!"* (His last words.) Hicks immediately notified all agencies and prepared for the immediate initiation of an existing "Emergency Response Plan."

At AFRICON, General Carter Ham attempted to mount a rescue effort, but is told to "Stand Down". By 10:30 PM, an unarmed drone is overhead above the compound and streaming live feed to various "Command and Control Agencies" so everyone watching that feed knew damn well what was going on.

At 11:30 PM, Woods, Doherty and five others leave Tripoli, arriving in Benghazi at 1:30 AM on Wednesday morning where they hold off the attacking mob from the roof of the compound until they are killed by a direct mortar hit at 4:00 AM.

So nothing could have been done, eh? Nonsense! If one assumes that tanker support really "was not available," what about this:

When at 10:00 PM, AFRICON alerts the 31st TFW Command Post at Aviano Air Base, Italy of the attack, the Wing Commander orders preparation for the launch of two F-16Cs and advises the Command Post at NAS Sigonella to prepare for hot pit refueling and quick turn of the jets.

By 11:30 PM, two F-16Cs with drop tanks and each armed with five hundred 20 mm rounds are airborne. Flying at 0.92 Mach, they will cover the 522 nautical miles directly to NAS Sigonella in 1:08 hours. While enroute, the flight lead is informed of the tactical situation, rules of engagement and radio frequencies to use.

The jets depart Sigonella at 1:10 AM with full fuel load and cover the 377 nautical miles directly to Benghazi in 0.8 hours, arriving at 1:50 AM which would be 20 minutes after the arrival of Woods, Doherty and their team.

Providing that the two F-16's initial pass over the mob, in full afterburner at 200 feet and 550 knots did not stop the attack in its track, a few well placed strafing runs on targets of opportunity would assuredly do the trick.

Were the F-16's fuel state insufficient to return to Sigonella after jettisoning their external drop tanks, they could easily do so at Tripoli International Airport, only one-half hour away.

As for those hand-wringing naysayers who would worry about IFR clearances, border crossing authority, collateral damage, landing rights, political correctness and dozens of other reasons not to act – screw them. It is time our "leadership" gets its priorities straight and puts America's interests first.

The end result would be that Woods and Diherty would be alive. Dozens in the attacking rabble would be rendezvousing with "72 virgins" and a clear message would have been sent to the next worthless POS terrorist contemplating an attack on Americans that it is not really a good idea to "tug" on Superman's cape!

Of course, all this depends upon a Commander In Chief more concerned with saving the lives of those he put in harm's way than getting his crew rested for a campaign fund raising event in Las Vegas the next day and a Secretary of State who actually understood, "What difference did it make?" and a Secretary of Defense who was watching the feed from the drone and understood what the attack consisted of instead of making an immediate response that "One of the military tenants is that you don't commit assets until you fully understand the tactical situation."

Ultimately, it comes down to the question of who gave the order to stand down? Whoever that coward turns out to be should be exposed, removed from office and face criminal charges for dereliction of duty.

Editor's Note: Colonel Handley flew operationally for all but 11 months of a 26 year career in aircraft such as the F-86 Sabre, F-15 Eagle and the C-130A Hercules. Additionally, he flew 275 combat missions in Southeast Asia in the F-4D and F-4E. His awards include 21 Air Medals, 3 Distinguished Flying Crosses and the Silver Star. He has been there and done that!

The Silent Majority

by Stan Guzy



MITCHELL, EDGAR D., 85 – Apollo 14 Astronaut, who became the sixth man to walk on the Moon, died at a West Palm Beach hospice on February 5, 2015. His passing coincided with the 45th Anniversary of the Apollo 14 Mission that transpired from January 31 - February 9, 1971. The descent down to the surface of the Moon was froth with doubts and problems but Mitchell and Alan Shepard pushed on and completed the mission. Mitchell was born in 1930 in Hereford, Texas, and grew up working his father's cattle ranch in New Mexico. After service in the Navy, he obtained his Doctorate from MIT and joined NASA. Four loving daughters and a son survive him, one of his sons died previously in 2010.

BUCHERT, NORMAN C., 73 – of Merritt Island, FL, passed away on May 9, 2015. After receiving his B.S. and M.S. degrees in Electrical Engineering from the University of Florida, Norm joined NAA at KSC as an RF and Telemetry engineer working on the Apollo/Saturn Launch Vehicle Second Stage. Subsequently, he moved to the Apollo Command and Service Module organization to work on the experiments carried aboard. In 1972, he moved to Downey as a Space Shuttle integration engineer. In 1975, he returned to KSC to help design and build the Orbiter Processing Facility. Norm continued to advance in his 44-year career and retired as Director of Advanced Engineering for the Space Shuttle Program.

DIEM, HAROLD, 89 – died on August 1, 2015 after a tragic fall. Harold served in the U.S. Navy during World War II, obtained B.S. and M.S. degrees in Mechanical Engineering from UC Berkley and then joined Rocketdyne. He retired as Program Manager of Advanced Technology Programs. He is survived by his wife of 59 years, Catherine.

FLENT, JOHN B., 91 – of Carlsbad, CA passed away on December 20, 2015. John retired from LAD in 1992 with 37 years of service. At retirement, he was Supervisor of the B-1 Flight Control Simulator.

FRASER, JOSEPHINE, 95 – passed away on September 16, 2015. Josephine and her husband came to California in July 19, 1951 and were hired by NAA. Josephine retired after 23 years of service. She was very proud of her Polish heritage. She leaves an extended family.

IVEY, RICHARD E., "DICK", 88 – passed away in West Covina, CA on December 13, 2015. Dick had a 33-year career at Space Division on the Saturn, Apollo and Space Shuttle programs and retired as a Production Manager. He is survived by his wife, Nydia.

JONES, ROBERT M. – of Mission Viejo, CA. Bulletin returned, stamped "DECEASED". Robert retired from Space Division in 1990 with 31 years of service.

KNOX, ARTHUR C., 95 – died on February 5, 2016 at his home in Tustin, CA. Art graduated with a B.S. degree in Engineering from the U.S. Naval Academy in 1944 and was immediately deployed to the Pacific. Upon his return, he trained and became a Naval fighter pilot. In 1955, he resigned his commission and joined NAA as a test engineer. Over the next 25 years, he progressed from ejection seat to the Apollo and Space Shuttle programs. He retired in 1980 and is survived by his wife, Kathleen, 8 children, 29 grandchildren and 31 great-grandchildren.

MICHAEL, RICHARD, "DICK", 85 – of La Habra, CA died on January 16, 2016. A veteran of the U.S. Army, he graduated from the University of Oregon and had a career in aerospace, his last project being the B-1 wing design. He retired from NAA in 1985 and is survived by his loving wife of 40 years, Carolee.

MILLER, WILLIS, JR., "ED", 84 – passed away from natural causes on December 4, 2015. Willis began his career on the Navaho program in Downey, later became a spec writer for GPS components at Seal Beach.

NELSON, ANTHONY L., 64 – of Draper, UT, died on July 2, 2015. Obtaining his Aeronautical Engineering degree from the Polytechnic Institute in Brooklyn, NY, Anthony joined NAA at Downey as a Structures engineer on the Space Shuttle and International Space Station. With 33 years of service, he retired to Draper, Utah. He is survived by his wife, Marie.

SIMMERMACHER, RICHARD A. – passed away in 2014. He started at NAA after earning his degree and moving to California. He went to Calcomp and, finally, to Boeing. He is survived by his wife, Margie.

SCHMIDT, JEFF, 92 – of King City, CA passed away on January 20, 2016. Jeff served at Autonetics on the Hound Dog and Minuteman programs for 34 years and retired as Chief Engineer and Vice President of Quality Control and Logistics.

STELLE, ALLAN M., "MAC", 94 – passed away peacefully in Thousand Oaks, CA. In 1950, he joined the NAA Atomic Reactor Program and retired in 1981. He became very active in the water scarcity issue; became the Director of the Los Virgenes MWD. After their five children had grown, he and his wife, Alice, parented 17 teenage foster children.

TIBERIO, LUCIO, "LOU", 86 – died at home in Canyon Lake, CA on October 8, 2015. He was an unusual aerospace engineer and was often sought after by other companies to work on special projects including NASA. He is survived by the love of his life for over 40 years, our Bulletin Staff colleague, Sonnie Robertson Tiberio.

WALSH, DONNA J., 88 – passed away at home in Hawaiian Gardens, CA on December 1, 2015. She started at LAD in 1955 and transferred to Space where she worked for several executives. She retired in 1993 with 38 years of service.

WEBB, ANITA (SCALABRINI) – a lover of the great outdoors, an avid hiker and a dedicated conservationist, Anita left this world on August 19, 2015. She retired from Space after 23 years of service. After retirement, she volunteered her services to the Salvation Army prior to moving to Citrus Heights, CA in 2003.

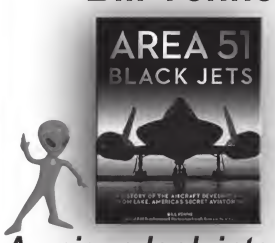
YOSHIDA, TAMIO, 87 – died on January 16, 2016 in Las Vegas, NV. Raised in Orange County, he earned an A.A. degree from Santa Ana Junior College, served two years in the Army, attended National Trade School and was hired at NAA/RI as a designer for 30 years. At 58, he took early retirement and lived in Duarte, CA.

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2016 Annual Luncheon

Saturday April 30, 2016

Aviation
Author and Historian
Bill Yenne



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— John F. Kennedy

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North American Aviation Retirees Bulletin
"Where The Best Never Rest"

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Larry Davis photo collection

Col. Francis Gabreski next to an F-86E that he flew when he was Commanding Officer of the 51st Fighter-Interceptor Wing in 1952. "Gabby" shot down 3½ MiGs while he was assigned to the 51st Wing.

NORTH AMERICAN AVIATION
Retirees Bulletin
"Where The Best Never Rest"

Summer 2016

NORTH AMERICAN AVIATION
2016 OUTSTANDING ACHIEVEMENT AWARDS



Cadet First Class
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Outstanding Cadet in Aerodynamics

Cadet First Class
Jacob P. Fischer
Excellence in Basic Research, Aerodynamics

Cadet First Class
Ryan J. Grimes
Outstanding Cadet in Astronautics

Cadet Candidate
Hunter Brown
Outstanding Cadet Candidate, U.S. Air Force Academy Preparatory School

NORTH AMERICAN AVIATION
Retirees Bulletin

North American Aviation Retirees Bulletin, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAA Retirees Bulletin can be contacted at The Boeing Company, Seal Beach facility by phone at (562) 797-3836. Send mail to:

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Dear NAA Retirees Bulletin Subscriber

As the year races to its predictable end, we, the volunteer staff members of the Bulletin recognize the growing shadows within our own lives. After sixteen years of struggle to find old NAA photos and historical records, they have been found and are being made available to us by the Boeing History Office. Fresh authors are stepping up with new articles about the many events that made North American Aviation the greatest aerospace company in the world. It is wonderful news but it is also sad news because we are fading quickly. We shall soon be forced to bring this magnificent publication to its climactic end. I will not cry over its passing but there is one issue that remains a stone in my craw. It is my inability to convince the Commanding Powers at the United States Air Force Academy that our proposal to place an NAA granite Memorial Bench on their campus is not some commercial invasion of their sacred grounds. It is only our desire to demonstrate to our finest young people that we provided their predecessors the weapons to match their courage and that they are always in our thoughts, our hearts and our prayers here and in the hereafter!

Although we shall no longer be available to provide technical speakers on campus and representatives at the graduation ceremonies, the four North American Aviation Outstanding Achievement Awards presented to the two top performing graduating Aeronautical cadets, the one Astronautic cadet and the Cadet Candidate graduating from the Academy Prep School have been endowed to be presented yearly into perpetuity and should be presented by the faculties in our name.

In keeping with the North American Aviation tradition of always pushing beyond existing boundaries and providing the best, we are preparing one last historical Masterpiece that will assure our introduction to generations yet to come! More about this later!!!

In this issue, Chuck Lowry reports on the visit he and his son, Allen, made to the USAF Academy as our technical speakers. They were warmly welcomed for a second time and very pleased with the outcome. They were followed by Paul Hirsh, representing North American Aviation in the presentation of the NAA Awards. Again, the welcome was congenial, including tickets to the beautiful graduation ceremony at the stadium.

Retiree Ray Walsh came up with an outstanding article gleaned from an annotated photo album maintained by his father, First Lieutentant Raymond Walsh as intelligence and armament officer for the USAAF 27th Fighter Bomber Group during World War II. He served with the unit in its nomadic advance through North Africa, Sicily, Italy and, finally through France into Germany flying the North American Aviation A-36s.

Our Boeing volunteer historian, John Fredrickson found an old article amongst the North American Aviation crates on the flight testing of the F-107A. The maiden test flight was far from a success but that is why you test fly before you place the intended aviator in the cockpit.

Good friend Ben Boykin brings us another story from his days in the Air Force stationed in Pacific stations. You will recall his last story when he managed to become an "Ace" by destroying a fleet of Japanese fishing boats beached on the sand in Japan with his F-86.

Until the next issue: Stay healthy! Stay happy! Stay Alive!

The United States Air Force Academy and North American Aviation

You, our readers, and several thousand other retirees spread over this magnificent nation are all that is left of what was once the greatest aerospace company in the world, North American Aviation Inc. This historical name is quickly getting pushed back into the dusty corners of history along with others such as Fokker, Berliner-Joyce, Curtiss, Bell, Republic, Douglas, McDonnell, Consolidated, Chance Vought and Vultee. Even our obituaries often identify us only as aerospace workers or as Boeing employees although we only served our closing years with that company. For this reason, the volunteer staff of the Bulletin has sought out a way to extend the name North American Aviation beyond our declining years. We thought of establishing a scholarship with UCLA but when that institution was given our supersonic wind tunnel, they turned around and sold it for common real estate. Perhaps, one of the best appraisals of what had become of "Our Company" was made by John Moore, the President of Autonetics, in a Spring 2002 article that he wrote for the NAA Retirees Bulletin.

"One of the great tragedies of the current high technology era is that the name of what was arguably the greatest high technology enterprise progenitor of this era is no longer known to most of its present beneficiaries. That name is North American Aviation, Inc. (NAA). Even most of us who have been privileged to work together at NAA seldom recognize the importance of the legacies that we have left to the technology, economy and standard of living that exists today.

"Indeed, a strong case can be made that without the requirements, priorities and government risk capital, plus, the enterprises that they spawned, the world's standard of living could have taken more than a century longer to reach its present level; the world would have been denied hundreds of millions of important jobs and career opportunities; and world civilizations could have been denied the capabilities to survive current and projected battles against population growth, affordable resource depletion and man's ravaging of the earth's ecosystems.

"Furthermore, NAA should not only receive accolade for its many technological firsts and advances in systems engineering; it also made substantial contributions to the management of large, multi-faceted programs and the evaluation of high technology-based business opportunities. How do I know all of this? I was there during those heady days of the 1950s and 1960s when risks were taken and leverage technology was fashioning a new technology-based era."

Our Sonnie Robertson suggested that we examine the possibilities of a scholarship with the United States Air Force Academy. Through our Air Force friends, we connected with the institution and found that scholarships are not accepted since the Government covers all basic costs. However, the Academy has individual recognition awards for each department which are sponsored by interested outside parties and it also has a Preparatory School on campus which provides an intensive ten month program for those applicants who just did not quite make the cut but are still strong candidates for the Academy. The Prep School is modeled after the Academy but does not have an award program. The NAA Retirees Bulletin has established and funded four North American Aviation Recognition Awards to be presented into perpetuity: two in the Aeronautics Department, one in the Astronautics Department and one in the Prep School to be presented to the outstanding graduating cadets and cadet candidate. When we learned that no existing aerospace company has a cooperative relationship with the Academy, we immediately dispatched our finest as technical speakers to address the students on related technical issues. We cannot think of a better way to perpetuate the name North American Aviation than with young, patriotic Americans dedicated to the defense of our Nation. God Bless them all!

Air Force Academy Graduation – 2016

by Paul Hirsh

The schedule of events began on Tuesday, May 31st when Capt. Mike Wilkinson met my daughter Jennifer and I at the visitor center and escorted us to the Aeronautics classroom for the Aeronautics awards presentation. I was afforded ample time to explain our presence at the graduation and to talk about some of the major contributions made by North American Aviation, including the T-6 Texan (the current cadet's trainer is the Beechcraft T-6, a 1,100 HP turboprop on steroids), the P-51 Mustang, the B-25 Mitchell, the F-86 Sabre, the F-100 Super Sabre, the XB-70 Valkyrie (Cecil), and the A3J Vigilante. I presented the NAA Bald Eagles Award to Cadets Colby R. McGinley for achievements in Aerodynamics, and Jacob P. Fischer for Basic Research in Aeronautics.

Following the Aeronautics Awards, we were escorted to the Astronautics classroom where we talked about Astro programs at NAA including the X-15, the GAM-77 Hound-Dog, the AGM-114 Hellfire Missile, the Apollo Program, the GPS and Space Shuttle Programs. I then presented the NAA Bald Eagles Award to Cadet Ryan Grimes for Research in Astronautics.

There were numerous references and discussion of North American Aviation during the award presentation ceremonies and several senior officers spoke eloquently of their experiences in flying NAA birds including the F-100 and B-1B. We also found time to walkthrough some of the many Aero and Astro research laboratories, and hear of the many Cadet achievements. We were escorted between the various facilities, including driving us to our car at the end of the day by Capt. Brian Crouse of the Astronautics Department.

We attended the formal Cadet Graduation ceremonies on June 2nd and were fortunate to hear President Obama's speech to the Cadets and witness the Cadet Graduation Certificate Presentations by President Obama; concluding with the tossing of their hats to children lucky enough to be in attendance; and finally, the performance of the U.S. Air Force Thunderbirds at the conclusion of the commencement ceremonies. A final moment of excitement was to learn of Thunderbird Pilot Major Alex Turner ejecting from his F-16 plane crash upon his approach to Peterson AFB following the Thunderbird exhibition, and receiving a handshake from President Obama before his departure on Air Force One.

I wish to thank all of my fellow NAA Retirees for selecting me to represent them on this marvelous occasion.



Photo courtesy of Lt. Col. Kurt P. Rouser, USAF

The Award for the Outstanding Cadet in Aerodynamics was presented to C1C Colby R. McGinley of Hamburg, Iowa by NAA Representative Paul Hirsh.



Photo courtesy of Lt. Col. Kurt P. Rouser, USAF

The Award for Excellence in Aeronautics Basic Research was presented to C1C Jacob P. Fischer of Wichita, Kansas by NAA Representative Paul Hirsh.



Photo courtesy of Lt. Col. Kurt P. Rouser, USAF

The Award for Outstanding Cadet in Astronautics was presented to C1C Ryan J. Grimes of Sacramento, California by NAA Representative Paul Hirsh.



Photo courtesy of Dawn M. Ellis, USAF Academy Preparatory School

NAA Retirees Representative, LTC John Swanson, U.S. Army (Ret.) presented the NAA Recognition Award for the USAF Academy Preparatory School Outstanding Cadet Candidate to Candidate Hunter Brown of Las Vegas, Nevada. Hunter will soon join other men and women as Cadets of the USAFA Class of 2020.

NAA Technical Speakers Visit USAF Academy

by Charles Lowry

We visited the USAF Academy on April 11th and 12th to fulfill the NAA Retirees agreement implemented several years ago with the Academy to provide technical speakers for the Aeronautical and Astronautic departments. Upon our arrival, we first met that evening with the Tau Beta Pi honorary fraternity at Uncle Buck's Restaurant. The meeting is normally attended by faculty with a few outsiders. This time, families were invited so they had the biggest attendance ever. It was especially gratifying for us because of the large number of Junior High and High School students were there—with much interest and many questions! I spoke first, followed by my son, Allen. Allen rewarded all who asked questions with Apollo and Space Shuttle commemorative coins and flight patches.

The next day, Allen spoke to a cadet aircraft design class and a cadet astronautics class. Again, much audience participation and many questions asked. In addition to interest in his subject matter, the cadets were probing for ideas we might provide to help with their class projects. Finally, I spoke to a combined forum of approximately 100 freshmen and sophomore cadets on the history of the Apollo and Shuttle programs and the future of manned space flight.

As on our previous visit, we were treated royally and given a tour around the academy. We visited labs and met many of the faculty and researchers. They briefed us on some of their ongoing research programs such as wind tunnel testing and asked for our opinions/ideas. They really enjoy hosting the NAA Retirees and appreciate the significance of what the Company did to support the Air Force over the years with quality aircraft!



Photo courtesy of Lt. Col. Kurt P. Rouser, USAF

Charles Lowry presented and discussed the Apollo Program challenges and accomplishments with Tau Beta Pi fraternity members, their families and colleagues.

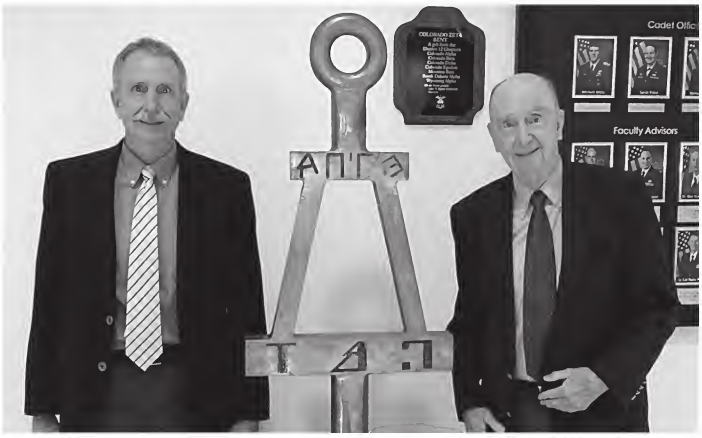


Photo courtesy of Lt. Col. Kurt P. Rouser, USAF

NAA Retirees repesentatives Allen and Charles Lowry at the Tau Beta Pi Colorado Zeta Chapter Bent following their presentations to the Air Force Academy cadets.



Photo courtesy of Lt. Col. Kurt P. Rouser, USAF

Allen and Charles Lowry inspired young admirers to continue a legacy of space discovery.

The A-36s of the Nomadic 27th Fighter Bomber Group

by Raymond F. Walsh

During World War II, my Dad, 1st Lt. Raymond Walsh, served with the 27th Fighter Bomber Group which consisted of three fighter-bomber squadrons: the 522nd, the 523rd and the 524th. He was the Group's armament officer and intelligence officer whose task it was to coordinate the air reconnaissance photographs. This gave him access to a myriad of photos taken by various sources throughout the European campaign. Like many vets, he did not talk much about the war years. However, late in his life, he produced an annotated photo album tracing the journey of the 27th. The photos in this article are taken from his story.

The 27th was formed to provide bombing and strafing air support for our ground troops as they advanced across North Africa, through Sicily then Italy and, finally, through France into Germany. As such, the 27th was always at the forefront of the Allies' advances. Dad described the Group's journey as "nomadic" in his handwritten summary of their postings.



Raymond Walsh photo collection

1st Lt. Raymond Walsh in his operational tent along the flight line at San Antonio, Italy

THE NOMADIC 27th GROUP ~ JULY 1942 - NOV. 1945

14	July, '42'	Key Field, Meridian, Miss.	5	June '44'	La Banca (Anzio), Italy
15	Aug. "	Hattiesburg, Miss.	7	June "	Ciampino (Rome), Italy
10	Sept. "	Esler Fld., Alexandria, La.	4	July "	Voltone, Italy
18	Sept. "	Hattiesborg, Miss.	13	July "	Seraggia, Corsica
8	Oct. "	Esler Fld., Alexandria, La.	18	Aug. "	Le Luc, France
28	Oct. "	Harding Fld., Baton Rouge, La.	20	Aug. "	Salon, France
21	Nov. "	Camp Kilmer, N.J.	7	Sept. "	Brun (Lyon), France
12	Dec. "	Staten Island, N.Y.	12	Sept. "	Loyettes, France
26	Dec. "	Mers-El-Kabir (Oran) Algeria	3	Oct. "	Tanquinia, Italy
26	Dec. "	"Mud Hill"-St Barbe Du Tlélat, Algeria	1	Dec. "	Pontadera, Italy
1	Jan. '43'	Nouvion, Algeria.	19	Feb. '45'	St. Dizier, France
1	April "	Fez, Morocco	19	March "	Toul - Ochey, France
1	June "	Korba (Cap Bon), Tunisia	3	April "	Biblis, Germany
18	July "	Gela, Sicily	23	June "	Sandhofen (Mannheim), Germany
31	Aug. "	San Antonio, Sicily	15	Sept. "	Echterdingen (Stuttgart), Germany
13	Sept. "	Cappaccio (Paestum), Italy			Antwerp, Belgium
4	Nov. "	Gaudo, Italy	5	Nov. "	Ft. Dix, N.J.
19	Jan. '44'	Pomigliano, Italy			
10	April "	Castel Volturno, Italy			
9	May "	Santa Maria, Italy			

Raymond Walsh photo collection

Postings of the 27th Fighter Bomber Group from Meridian, Mississippi in 1942 through Africa, Sicily, France, Germany and, finally, New Jersey in 1945.

When the 27th was reconstituted and posted to North Africa, it was outfitted with the North American Aviation A-36 as its primary operational aircraft. The Group's designation was then changed from the stateside "27th Light Bomb Group" to "27th Fighter Bomber Group." The first units to receive the A-36 were the 86th and the 27th. On June 6, 1943, the A-36s went into combat for the first time, with the planes from the 27th participating in an attack on the island of Pantelleria. Moving was a constant affair. It was recorded that after the invasion of Sicily, General George S. Patton set up his headquarters in Gela, Sicily on July 14, 1943. Dad's record shows that the 27th was operational out of Gela only four days later on July 18th after an arduous move from North Africa. The A-36s of the 27th were instrumental in supporting the Army during the Allied landings at Salerno, Italy. The Group was awarded the Distinguished Unit Citation for its September 10, 1943 actions which prevented three German armored divisions from reaching the Allies' Salerno beachhead. With the successful landing at Salerno, the Allies were able to continue their thrust into Italy.

Conditions at the airfields were often rustic at best. The A-36 had to contend with runways that would challenge the best of pilots. In addition to hazards from direct enemy contact, the air bases had to contend with crippled aircraft returning from combat missions. A P-38 crash landed into the 524th Squadron's Operations Center, inflicting many U.S. casualties. In another incident, an aircraft was returning to base with a hung bomb. When the plane touched down, the bomb detached and bounced down the runway, finally exploding near an encampment. Later, Dad returned to his tent and found it shredded by bomb shrapnel. But for being on duty, he would have been another "friendly" casualty. Needless to say, future tent sites near runways were viewed as "off limits."



Raymond Walsh photo collection

A P-38 crashing into the 524th Operations Center. Blurred in the foreground is an A-36 taking off.



Raymond Walsh photo collection

An A-36 from the 524th Squadron with support personnel.

As the war progressed, the Group's A-36s were replaced with P-40s and P-47s. By June 1944, the P-47 was the primary aircraft of the 27th. The Group designation was changed, yet again, going from "Fighter Bomber Group" to "Fighter Group." The 27th supported the Allied invasion of Germany. In his diary, Dad noted that the 27th was the first fighter group in Germany. With its advance into Germany, the Group encountered unusual German weapons such as experimental fighter planes.

The Group became operational in Biblis, Germany on April 3, 1945, and was stationed there on V-E Day (May 8, 1945). With five Distinguished Unit Citations, the airmen of the 27th were among the most decorated USAAF units of World War II.

The Air Force Museum at Wright-Patterson AFB (Dayton, Ohio) has a fully restored A-36 in its collection. The plane is decorated with the colors and insignia of Capt. Lawrence Dye from the 522nd Squadron of the 27th. Visible are the dive brakes which enabled the A-36 to perform the vertical dive bombing maneuvers. Also, the Collings Foundation has a flight-worthy A-36 in their extensive collection which includes many restored WWII aircraft.



Raymond Walsh photo collection

An A-36 in field at San Antonio, Italy.



Raymond Walsh photo collection

Among the experimental Luftwaffe aircraft damaged and captured at an airfield in Germany were these unusual twin-engined Dornier Do 335 fighters.



Raymond Walsh photo collection

The North American A-36 in the insignia of the 27th Fighter Bomber Group at Air Force Museum in Dayton, Ohio. Visible on the wings are the dive brakes that enabled the A-36 to perform the vertical dive bombing maneuvers.

One of the most memorable photos of Dad's album is the picture of Bob Hope and his troupe which celebrated V-J Day (the end of WWII) with the 27th on August 15, 1945 at Sandhofen, Germany. It was a joyous occasion for all!

About the author: After receiving bachelors and masters degrees at MIT, the author started work at Rocketdyne shortly after the merger of NAA and Rockwell. At Rocketdyne, Ray worked in Advanced Programs analyzing rocket engine systems like the SSME. He was part of the group that developed high-energy laser systems at Rocketdyne. After leaving Rocketdyne, he worked at the Schafer Corporation on high-energy lasers and rocket engine systems. He has remained active in rocket engine technology through consulting for the Air Force on advanced engine concepts including possible replacements for the Russian engine used on the Atlas launch vehicle.



Raymond Walsh photo collection

Bob Hope and his USO troupe celebrate V-J Day with the 27th Fighter Group in Sandhofen, Germany.

Flight Testing the F-107A

As recovered from stored files by John Fredrickson

The stakes were high on the morning of September 10, 1956, as North American Aircraft (NAA) chief test pilot, Robert "Bob" Baker, Jr. prepared the experimental F-107A for its maiden flight at Edwards AFB, CA. The F-107A, an airplane without an official name, was already the underdog in a "winner-take-all" fly-off with the Republic F-105. Budget constraints dictated that the United States Air Force (USAF) would order only one of the competing designs into production. The pre-production order for the F-107A single seat jet fighter had already been trimmed in phases from 33 to only three aircraft.

The string of dominant NAA fighter aircraft designs started during World War II with the legendary P-51 Mustang. With the post war advent of swept-wings and jet engines, the Mustang was quickly followed by multiple versions of the F-86 Sabre and then the F-100 Super Sabre. The next step in this evolution was to be the F-107. "Air-superiority" was the design goal – which is defined as a warplane that excels at air-to-air combat. The design included four forward pointing 20 mm guns mounted on both sides of the fuselage and 800 rounds of ammunition. Provisions for bombing capability were included but these were secondary to the dog-fighting capability.

Meanwhile, the F-105 was designed with an internal bomb bay – which better fit the Cold War expectations of many senior USAF officials. Six prototypes were constructed and flight testing was conducted concurrent with the F-107 program. The F-105 was heavier and lacked the agility of the F-107. Both airplanes were designed around a single similar type J75 afterburner equipped turbojet engine and both were capable of supersonic flight in the Mach 2 range.

While the F-107 airframe was of conventional construction, the overall design included very advanced features. The vertical and horizontal stabilizers were not hinged, but fully moved; the flight controls were of a new design; the avionics were advanced. The most startling feature was a huge air-inlet immediately behind the cockpit. It was located above the fuselage for several reasons:

- The shortest and most direct route for air to enter the engine.
- Allowed radar to be installed in the nose.
- Freed the bottom of the craft available for a nuclear weapon or fuel tank.
- Kept the sides of the fuselage clear for guns.
- Reduced the chance of FOD (foreign object damage) to the engine from items ingested from the ground.

The air inlet design included an advanced system of movable ramps to condition the airflow into the engine for supersonic flight. Cooling air was directed to the fuselage structure and certain external engine components – to include the afterburner.

The three F-107 aircraft were designed and assembled at the Inglewood plant on the boundaries of the Los Angeles International Airport (LAX); however, dangerous flight testing was no longer allowed at the busy commercial airport. The finished product was loaded aboard a flat bed truck for transportation over surface streets to Edwards AFB, which was located in the high desert 107 miles north and east of LAX. Edwards remains at the crux of USAF flight testing because it has abundant open space, favorable flying weather, its remote location, and a dry lake bed that allows for runway overruns or other emergencies.



Boeing Historical Office photo

The North American Aviation F-107's advanced features are seen in this photo on the ramp at Edwards AFB.



Boeing Historical Office photo

The F-107 on a truck in the LAX facility as it prepares to depart for Edwards AFB.

Three new jet engine test stands, fuel tanks, and ancillary buildings were constructed on NAA owned real estate at Santa Susana, a rural area in the hills at the north end of the Los Angeles basin. This is where the developmental F-107 advanced jet engines were tested.

Ejection seats were a post-war innovation that greatly increased aircrew survival following an in-flight emergency. The early seats were originally tested using a homemade crash test dummy. Use of a standard test item with the attributes of a typical young American male of that era was later dictated. The Sierra Manufacturing Company fabricated from primarily plastic an articulated, 165-pound mannequin that could endure extreme g-loads and other injuries beyond human endurance. His name was "Sierra Sam." With hinges in those locations necessary to replicate human movement, he could be found between tests reposing in the human factors laboratories of all the major aerospace companies. Normal attire included a flying helmet, flight suit, and nine-inch black leather jump boots.

One informal nickname given the F-107A was "Man Eater" – a reference to the large air intake immediately behind the cockpit. The ejection seat was of NAA design and with the exit trajectory proximate to the gaping maw, extensive ejection seat testing was dictated. For the well being of the test team, the crash dummies were utilized, and they really took a beating! Successful bailout during that era dictated not only a specified minimum altitude but also sufficient forward air speed. Since the tests were all conducted at ground level, they did not provide sufficient altitude for the parachute canopy to properly deploy before the unfortunate dummy impacted the ground. Consistent with other contemporary aircraft, a back



Boeing Historical Office photo

Jet engine test stands #1 and #2 at Santa Susana.



Boeing Historical Office photo

Before test – technician preparing ejection seat and dummy before fifth sled run.

style parachute was utilized. The pilot sat on a survival kit containing a small one-person life raft, signaling devices, and other emergency items.

Initial tests were performed by placing nets behind a static airplane and test firing the seat. Normally, the canopy would be blown clear of the aircraft as a first step in the ejection sequence; however, tests were conducted to ensure the pilot could survive being blown through the closed canopy and in other tests Sierra Sam was clad in a pressure suit.

Finally, a rocket sled was fabricated to run on a special section of railroad track constructed to validate ejection at various speeds. A total of 11 of these tests were conducted during 1956 and into 1957. Some failures were encountered. Fortunately, no human pilot ever found it necessary to eject from an F-107.



Boeing Historical Office photo

During test – rocket propelled ejection seat in flight.



Boeing Historical Office photo

After test – crash dummy face down in the dirt with parachute behind.

Normally, test flying at Edwards AFB commenced with first-light to ensure calm air and cool temperatures; however, the first flight of the F-107 was scheduled for mid-morning on September 10, 1957, to allow the Los Angeles-based executives time to drive to Edwards AFB and witness the milestone firsthand. The "show" turned out to be more dramatic than they desired. Accompanied by an F-100 chase plane, the take-off was normal. After a couple of attempts, the landing gear was fully raised and secured; however, a problem intervened upon testing of the controls and climbing to 35,000 feet. A warning light indicating "low oil" forced preparations for a premature landing.

Mach 1 was exceeded during the hasty descent. Seasoned experimental test pilot Bob Baker and ground control were both concerned that lack of lubricant could cause the engine to seize at any instant. Unburned fuel caused the landing weight to be in excess of plan. The problems further mounted when it was discovered the flaps could not be fully lowered because of flight control issues. Baker was about to demonstrate the utility of the Rogers Dry Lake bed at Edwards.



Boeing Historical Office photo

NAA chief test pilot Bob Baker at Edwards AFB.

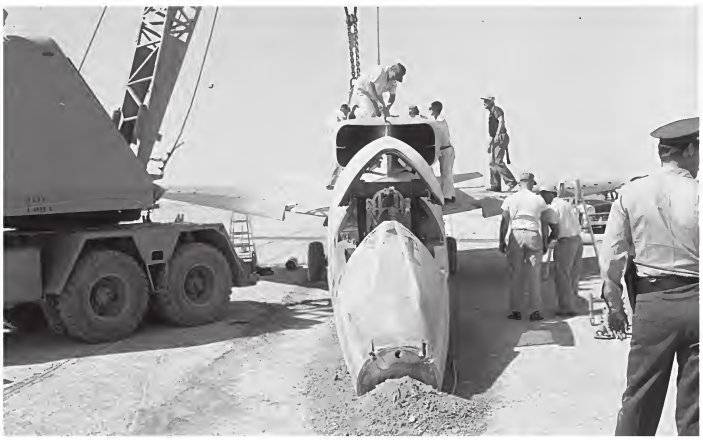
The approach was faster and at heavier weight than desired. Landing speed was very close to the design limits of the tires. Things got worse when they screeched onto the concrete of Runway 04 after the brief 40-minute flight. The 16-foot diameter drag chute did not deploy when activated. Investigation determined the pilot chute had opened with such force as to break the link between it and the main canopy. The parachute remained neatly stowed in its compartment at the base of the vertical tail. The F-107 main gear tires never failed but were skidded down to the cords that underlay the rubber as the craft careened down the runway and onto the dry lake bed for more than four miles. Baker had slowed sufficiently to consider commencing a U-turn when the nose tires encountered a small wash. The nose gear strut broke and the entire assembly snapped off, the radar housing sheared, and the forward bulkhead of NAA's hottest fighter ingloriously pushed sand for almost 1,600 feet. Baker opened the canopy and climbed out. The landing roll was 22,000 feet on a runway with 15,000 feet of pavement.

As the photos and measurements were being completed, a mobile crane and flat bed truck were enroute to retrieve the wounded bird before the sun had set. Nobody was hurt, the damage was repaired in a few weeks, and the nose gear strut was strengthened. All three aircraft completed the remaining phases of their assigned flight test duties without further major incident.



Boeing Historical Office photo

Close up of the skidded tire on the main landing gear.



Boeing Historical Office photo

Mobile crane preparing to pick up the damaged F-107A.

Both competing programs had plenty of flight test challenges. Issues with the F-107 included chronic drag chute problems, fuel leaks caused by fasteners that abraded the bladders, flight control issues, and an engine fuel system related defect that eroded subsonic performance above 40,000 feet altitude. These would have been easily fixed had a production contract been awarded.

In the end, Republic Aircraft of Long Island was awarded production contracts for the F-105 and it was bestowed the official name of "Thunderchief." Informal monikers included "Thud" and "Lead Sled" – a reference to its maneuvering limitations. After many developmental stumbles, the bugs were eventually eliminated and the Thunderchief served well during the Vietnam War.

One must wonder about the consequences if the decision had been reversed. Encountering an F-107 in the skies over Vietnam would have been a MiG pilot's worst nightmare; however, in a war that was grossly mismanaged by both the Johnson and Nixon administrations, not even a better dog fighter would have swayed the ultimate outcome.

Many of the advanced features of the F-107 found their way into the Columbus-built Navy A3J (later designated A-5) "Vigilante." The third and final F-107 built was assigned to NASA predecessor, NACA, for research into high-speed flight – until it was damaged in a takeoff accident in 1959. The pilot was Scott Crossfield and it was his first and only attempt to fly an F-107.

With the loss of the F-107 contract, the best days of high-rate fighter plane production by North American Aviation in California were over. Two of the original three F-107s are preserved. One can be seen at the Air Force Museum in Dayton, Ohio and the other is at the Pima Air and Space Museum just south of Tucson, Arizona.

Apollo/Shuttle Engineering Luncheon



This monthly Apollo/Shuttle Engineering Luncheon was held on April 20, 2016 with some new faces present and some old ones missing. Among those present were Jim Rowe, Frances Farris, Ken Muzzy, Lloyd Mustin, Chuck Lowry, Larry Korb, Charlie Helms, Susan and Ed Smith and Will Swan. This informal chance to break bread together is held on the 3rd Wednesday of the Month at the Hometown Buffet, 1008 E. 17th Street, Santa Ana, California at 11:30 A.M. For more information, contact Jim Rowe at (714) 637-3020.

Congratulations and Best Wishes to

Terry and Merle Nieuwlandt of Placentia, California celebrating their 60th Wedding Anniversary

F-86D Maximum Flight Range Verification for Ferry Flights Over Water with 200-Gallon Drop Tanks

by Ben Boykin

In the summer of 1954, following advanced pilot training at Nellis AFB, Nevada in the F-86F to become combat ready as a daytime fighter pilot, I was reassigned to the 41st Fighter Interceptor Squadron (FIS) at Yokota AB in Japan, flying F-86Es. In January 1955, the 41st FIS transitioned into the F-86D all weather fighter aircraft.

In January 1956, I was assigned as the Flight Test Maintenance Officer for the 41st FIS reporting to Captain Douglas A. Dodge. In April 1956, the 41st was alerted that the squadron might be relocated to the island of Guam. I was directed to establish a test program to verify the ferry distance the F-86D could successfully fly using 200-gallon drop tanks rather than the 120-gallon drop tanks the F-86D was designed to fly with.

Plan of Action

1. Contact North American Aviation and obtain what information was available on flying 200-gallon drop tanks on the F-86D and what, if any, flight restrictions or structural concerns may exist.
2. Locate a pair of 200-gallon drop tanks and modify as necessary to fit the F-86D.
3. Establish a flight test program to verify any change in flight characteristics and to verify what the long distance capabilities were for the F-86D with 200-gallon drop tanks.

North American Aviation Support

North American Aviation responded with their Letter No. PL-55-499, titled, *"Use of North American Aviation 200 Gallon Drop Tanks for Ferry Missions on F-86 Airplanes"*, dated 23 December 1955. It stated that the 200-gallon drop tanks were compatible with the F-86D but the tanks must have the "Stuka" fin modification to assure safe clearance in case of jettison. There were also some in-flight restrictions that were imposed due to structural wing load limitations.

Since the purpose of this flight test project was solely to determine the ferry range with the North American Aviation (NAA) F-86D aircraft equipped with NAA 200-gallon drop tanks, all flights would be in accordance with Tech Order 1F-86D-1 criteria for maximum cruise performance and the NAA flight restrictions as defined in above referenced NAA Letter which were:

"Installation of the 200 gallon tanks on the F-86D airplane without local wing beef up imposes the following flight restrictions:

1. *Symmetrical Flight:*
   (a) *Tanks plus fuel: 3.2 g to 0 g*
   (b) *Empty tanks: 5.0 g to 0 g*
2. *Unsymmetrical Flight:*
   (a) *No abrupt stick displacement, no continuous rolls, and angle of bank not to exceed 45 degrees*
   (b) *Tank plus fuel: 2.1 g to 0 g*
   (c) *Empty tank: 3.3 g to 0 g*
3. *Yawed Flight:*
   (a) *Flights into turbulent air should be avoided. No intentional yawed maneuvers above Mach 0.85*
4. *Additional flight restrictions should limit tank jettison to level flight altitudes and airspeeds above 220 knots IAS."*



Ben Boykin photo collection

1st Lt. Ben Boykin of the 41st FIS with the F-86D modified with 200-gallon drop tanks at Yokota AB, Japan.

200-Gallon Drop Tanks Located

We found a pair of 200-gallon drop tanks located at another on-base F-86E squadron, but they did not have the Stuka modification. We located and borrowed a Stuka-modified pair of tanks from another F-86 squadron at Misawa AB in Northern Japan. Our squadron Sheet Metal Shop was able to modify the 200-gallon drop tanks with custom fit fairings and fabricated compatible air pressure and fuel lines to accommodate the 200-gallon drops, on the F-86D wing.

Flight Planning

Nine flights were flown on F-86D, Serial Number 52-10131, equipped with two Stuka modified North American 200-gallon drop tanks. This aircraft had a -17B engine, with afterburner, with a one half nozzle thrust selector. Each flight was documented with such operational data as: 200-gallon tank fuel load; take off distance; afterburner configurations and changes; climb out data; time to cruise altitude; in-flight maneuvers demonstrating aircraft stability; stall speeds; documented any variations in flight vs. 120-gallon tanks; distance covered; total flight time and fuel remaining on landing.

Flight Summaries

Flight No. 1: Empty 200-gallon drops; check full flap down for clearance (1-2 inch); afterburner for takeoff to 35,000 feet in nine minutes; turn maneuvers of 10 to 45 degrees; no noted abnormal flight characteristics noted from 120-gallon drops; normal letdown and entry with loose pattern touching down at 140 knots. Flight time was 1:25 hours.

Flight No. 2: 100 gallons in each 200-gallon tank; 5,100 pound fuel load; takeoff with afterburner until 250 knots IAS, then continued climb 100% military power to 32,000 feet; at 0.70 Mach, let aircraft seek its own altitude maintaining 0.70 Mach to 35,000 feet. Performed several stall maneuvers in varying configurations of speed brakes in and out; gear down, varying flap settings, experiencing a stall speed of 110 knots that felt similar to 120-gallon tank configuration. There was a slight vibration felt but was attributed to the special fabricated

fairings which were replaced before the next flight. Flight time was 1:20 hours with 1,000 pounds fuel remaining on shutdown.

Flight No. 3: 150 gallons in each 200 gallon tank; 5,788 pound fuel load; takeoff with afterburner and picked up 0.54 Mach; continued climb to 30,000 feet at 100% power setting maintaining 500 feet/second climb rate; assumed 0.70 Mach letting aircraft seek its own altitude. This was a planned "round robin" flight from Yokota to Kumagaya to Daigo to Tokyo Range back to Yokota. Had to break off half way to Tokyo Range due to low fuel. Drop tanks fed out 25 minutes from takeoff, 140 miles into flight. It was a 1:40 hour flight covering 560 nautical miles with 800 pounds of fuel remaining. No abnormalities noted.

Flight No. 4: Full 200-gallon drop tanks; 6,435 pound fuel load; afterburner takeoff to 0.51 Mach, leveled at 30,000 feet letting Mach build to 0.74 Mach and continued climb-out to 32,000 feet. Flight was another "round robin" from Yokota to AY to Daigo to Tokyo Range to Yokota, including 14 turns of 30 to 180 degrees, covering approximately 700 nautical miles. Drop tanks fed out at 37 minutes after takeoff. Fuel remaining was 750 pounds. Flight time was 1:56 hours. No abnormalities noted.

Flight No. 5: Full 200-gallon drop tanks; 6,435 pounds of fuel; afterburner takeoff; same climb-out as previous flights to 35,000 feet over same course as previous Flight No. 4. Drop tanks fed out at 40 minutes from takeoff; included 14 turns of 30 to 180 degrees which directly affected airspeed, distance covered and fuel consumption. Winds at altitude were from 60 to 100 knots from 270 degrees. Flight time was 1:47 hours with 750 pounds of fuel remaining covering approximately 700 nautical miles. No abnormalities noted.

Flight No. 6: Same takeoff, climb out and flight configuration as previous Flight No. 5. Drop tanks fed out at 37 minutes at 210 nautical miles. 30,000 feet reached 46 minutes after takeoff. In-flight plan repeated with same flight course and in-flight maneuvers as previous Flight No. 5. Flight time was 1:53 hours with 700 pounds of fuel remaining. No abnormalities noted.

Flight No 7: Repeated conditions and flight course as previous flight but had an accompanying F-86D with 120-gallon drops flying along in loose formation for comparative data.

1. 200-gallon drops fed out 35 minutes, 210 miles into flight.
2. 120-gallon drops fed out in 12 minutes. The second 120-gallon tank F-86D had 2,700 pounds fuel remaining.
3. At 1:01 hours into flight, I had 2,700 pounds of fuel compared to the second F-86D with 1,600 pounds.

No abnormalities experienced but demonstrated fuel tank differences on feed out time and fuel remaining.

Flight No. 8: Repeated same takeoff, climb out and flight configuration as previous Flights. On this flight, 717 nautical miles were traversed in 1:52 hours with 1,000 pounds of fuel remaining. Drop tanks fed out 38 minutes into flight at 275 miles. Maximum altitude reached was 38,000 feet. No abnormalities encountered.

Flight No. 9: This final flight was a no afterburner takeoff with full 200-gallon drop tanks; flying another round robin from Yokota to Daigo to Matsushima to Miyako to Misawa to Niigata to Daigo to Yokota, approximately 733 nautical miles. Takeoff was no flaps for first 4,000 feet of roll when full flaps were executed at a rotation speed of 120 knots. 6,000 feet of takeoff roll was noted. Drops fed out 34 minutes after takeoff. Climb out was per Tech Order 1F-86D-1 criteria for maximum cruise performance. Airborne time was 2:05 hours with 600 pounds of fuel remaining.

Summary

1. All flights conducted on VFR days. Slow flying with gear, flaps and speed brakes showed no difference from 120-gallon drop tanks.
2. On return to base, all letdowns were from cruising altitude over the base with letdowns at 0.80 Mach, idle RPM.
3. On all flights, 200-gallon drops fed out equally not requiring any significant trim changes.
4. Approximately 1,100 pounds of fuel were consumed each 200 nautical miles after attaining cruise altitude.
5. Drop tanks became empty approximately 34 minutes from takeoff, approximately 215 NM on course.
6. All run-ups prior to take off made on the active runway.
7. Climbing Mach number was usually attained about 2,500 feet with A/B cut-off.
8. The 200-gallon drop tanks were removed from the aircraft utilizing the on-board jettisoning button into the drop tank ground slings to demonstrate safe jettison operations.
9. By utilizing these flights information, the following results were summarized with retaining the 200-gallon drop tanks:
   a) 717 NM with 1,000 pounds fuel remaining – Flight No. 8
   b) 749 NM with 700 pounds fuel remaining – Flight No. 6
   c) 750 NM with 600 pounds fuel remaining – Flight No. 9

Comparison to North American Aviation Data

Results of the above flight test program compare favorably with the information in the North American Aviation Letter Number PL-55-499, mentioned previously. NAA data showed:

a) 680 NM with 1,000 pounds fuel remaining
b) 720 NM with 800 pounds fuel remaining
c) 760 NM with 600 pounds fuel remaining

41st FIS Follow-on Action Results

After I had been reassigned to the 29th FIS, flying the all-weather Lockheed F-94C at Malmstrom AFB in Great Falls, Montana, the orders arrived, moving the 41st FIS to Guam. It was also determined that the flight over water could be safely flown using the 120-gallon drop tanks following Technical Order 1F-86D-1, and should fuel depletion become anticipated, jettison the 120-gallon drop tanks.

About the Author: Ben is a Retiree from Space Division with 37 years of service on the Navaho, Hound Dog and Apollo. He was a Chief Engineer on the Space Shuttle Program and the RSOC Director for Maintenance and Operation of the NASA MOD Facilities at JSC on the STSOC Program. He also served as the Program Manager for AlliedSignal at the NASA White Sands Test Facility in Las Cruces, New Mexico, where he currently resides with his charming wife, Janis.

54th Bald Eagles Reunion Luncheon

Photos by Sharon Simonsen



Guest Speaker Bill Yenne



Sam Iacobellis, Bill Yenne, and Erik Simonsen



Pat Cunningham and Bill Cunningham



John and Zung Pierro and Toni and Jack Ross



Bev Gresham, Pat Thiel, and Nancy Williamson



Ed Rusinek and Daughter Anita



Allen Lowry, Ken Muzzy, Bill Spencer, Frank Beckman, Ronald Moore, Ed Organ, Bob Hime, and Jack Radak.



Paul Hirsh, Ann Tack McClure, Ardy Hirsh, and Joan Armour



Peggy and Dale Stinson, Cathy Rodriguez, and Rachel Gomes

Contrails from the Past

by Ed Rusinek

Dear Ed,

I just wanted to tell you that I worked with Jim Pierce at the Columbus Division, reference the *Two John Moores* article. After a hard day's work at Holloman AFB conducting the Roadrunner missile flight tests, we had to drive 90 miles to El Paso where we were housed in motels. We were having a relaxing drink one evening when Jim asked, *"Do you mind if I get comfortable?"* We answered, *"No!"* and he removed his artificial leg. He too had been in a crash and had a special permit from the U.S. Navy to flight test the Vigilante.

In graduate school, my mentor was Dr. Richard Moore, the famous John Moore's brother. He wanted me to work with him as a graduate student. I said *"No."* I would rather emulate his brother. My life became a little difficult after that. John Moore's Autonetics built the flight controls for the Vigilante. They were very good with 400 Hertz A.C. sensors, amplifiers and actuators. They also built the Bomb Nav System and it was awful, badly impacting the Viggie's delivery and operation. It was a sort of an early TFTA radar for use with the LABS maneuver.

I was part of the Rockwell breakup of North American Aviation exactly as John Moore described it.

Both, he and I, went to work for McDonnell Douglas but neither of us could flourish there. They laid me off, telling me I was too honest to work in management!

— Erv Ulbrich, Whittier, CA

Ed's Resp.: Thank you, Erv, for your splendid historical glimpse at the people and projects that made up our wonderful company. Only one minor correction: Jim Pierce, after participating in countless air battles in the South Pacific during WWII without so much as a scratch, went to the beach with a friend that had a medical background. The friend spotted a nasty sore on his leg and warned Jim to have it checked. He did, it was found to be cancerous and Jim had his leg amputated! After a rushed recovery and the fitting of a prosthesis, he was reinstated to flight status. I know this because we both grew up in the Detroit area during the Depression under similar economic conditions and Jim asked me to edit his autobiography. One is very fortunate to meet and have as a friend a man like Jim Pierce, the two John Moores, Jim Brooks and others that display courage far beyond one's limited comprehension.

Dear Ed,

I worked for John Moore, the test pilot, during the early Apollo days and he still bore all his burn scars. He never talked much about his experiences in the Navy and it wasn't until I read his book that I learned about his horrible accident and where his scars came from. He stayed in Cocoa Beach after his NASA initiated departure from NAA and he and I remained in touch until his death. The other big trauma in his life that I remember vividly was the loss of his wife who was sitting in the back of their car when it was rear ended by a drunk driver. She died in John's arms at the scene.

— John Tribe, Merritt Island, FL

Ed's Resp.: If you did not know his story and the many crosses he had to bear, you would be left with the impression that here was a man with no serious issues in his life. He had an endless repertoire of jokes, stories and bawdy impersonations that brought on tears of laughter! His joy was the young family that remained standing statue straight!

Speaking of Standing Straight: You may have not noticed but after sixteen years, three of our original team of five volunteers—Sonnie Robertson, Stan Guzy and Vince Ramirez—have taken a debilitating crash in health. That will explain why your copy of this publication may arrive late! Please bear with us and say a prayer for us. Prayers are never wasted and right now we need all the prayers we can get!

"As technology evolves, we can never grow numb to the consequences of our actions. We have to hold ourselves to high standards, be even more transparent, and do everything in our power to prevent the loss of innocent life. That's how America goes to war. And that's how, ultimately, America also wins the peace."

— President Barack Obama
Commencement Address to the
U.S. Air Force Academy Class of 2016

The Silent Majority

by Stan Guzy



WILLIAMS, DONALD E., CAPT., U.S. NAVY, 74 – NASA Astronaut on two Space Shuttle flights, passed away February 23, 2016. He was a naval aviator, test pilot and mechanical engineer. He flew as pilot on Mission STS-51D aboard *Discovery* and as mission commander on Mission STS-35 aboard *Atlantis*. After retiring from the U.S. Navy and NASA in March 1990, he worked at Science Applications International Corporation (SAIC) as a Division Manager, working on several national and international projects in the Houston area. He is survived by his wife and two children.

SALVAY, MELVIN E., "GENE" – died at home in Encino, CA on April 8, 2016 surrounded by his loved ones. At the age of seven, he saw Charles Lindbergh land the *Spirit of St. Louis* at the airport in Kansas City and that set off the spark that led to an illustrious career in aircraft design. Graduating from the Curtiss-Wright Technical Institute in Glendale, CA, he took additional courses at Caltech. During World War II, he joined NAA in Kansas City where he modified B-25s to specifications required by Jimmy Doolittle to perform the Tokyo Raid. His career spanned the golden age of aviation design and innovation with Gene involved, going from slide rule to computer-aided design. After retirement from Rockwell International, Gene joined the Lockheed "Skunkworks" where he worked on stealth technology. In 1970, he went to Israel where he was instrumental in the development of the Kfir jet fighter. Gene was preceded in death by his loving wife, Betty.

BECK, LESTER H., CAPT., U.S. NAVY, RET., 90 – of Tustin, CA passed away peacefully on March 31, 2016. A 34-year veteran of the Navy, Les earned the prestigious Legion of Merit and Meritorious Service medals. After retiring from the Service in 1977, he joined NAA/Rockwell and Boeing. He was a man of vibrant intellect with many interests. He was predeceased in death by his beloved wife, Pat, by three months.

BLECK, ROBERT F., 83 – of Bellflower, CA died on February 17, 2016. He was an Electronics/Telemetry engineer at Space Division on Apollo and various satellite programs. He retired in 1990 with 29 years of service. Bob is survived by his loving wife of 60 years, Nancy.

CARROLL, WAYNE H., 94 – passed away on January 30, 2016 of natural causes. Wayne joined NAA in 1962 when he moved to Anaheim, CA and retired in 1981. He is survived by his loving wife, Marjorie.

CASEY, JOHN W., 99 – passed away on February 12, 2016 in Corvallis, WA. He escaped his impoverished beginnings by joining the Marines in 1934. Volunteering for flight training, he was stationed in the Virgin Islands on hurricane patrol. Leaving the Marines, he flew for Pan Am Airways and, later, joined the Curtiss-Wright Company as a technical representative. He was reactivated at the beginning of World War II by the Marine Corps and served in the South Pacific. Recruited by NAA as a Field Service Manager, he retired in 1968 as a vice president with 27 years of service.

EMERICH, GEORGE F., – of Fallbrook, CA. Bulletin returned, stamped "Deceased." George retired in 1982 from Autonetics with 35 years of service.

FERRYMAN, PETER R., "DUTCH", 94 – of Palos Verdes, CA passed away peacefully on February 6, 2016. During World War II, he flew 60 combat missions with the 12th Air Force in North Africa and Italy. He later flew more than 5,000 hours in 35 different military aircraft, including the P-51, P-38, P-47 and P-63. Retiring from the Air Force as a Lt. Colonel, he obtained an M.B.A. at Ohio State and took on a critical role on the Apollo and Space Shuttle programs.

FRENCHO, JOHN L., "JACK", 92 – of Columbus, OH, died peacefully in his sleep on February 25, 2016. Jack graduated from the University of Pittsburgh with a B.S. degree in Electrical Engineering after serving as a B-17 Navigator with the 324th Bomb Squadron, 91st Bomb Wing of the 8th Air Force over occupied Europe. He served at the Columbus Division for many years and retired as a Systems Research Engineering Chief. He is survived by his loving wife of 69 years, Nicki.

HARMAN, GRAYBILL B., "GRABE", 94 – passed away in Melbourne, FL on May 15, 2016. When he retired from the U.S. Navy he was a WWII flying boat pilot and a squadron commander of a P2V squadron. He joined NAA at the Columbus Division and, later, moved to Space in Downey. He then transitioned to KSC with the advanced Apollo Launch Team. After Apollo, he moved on to other contractors on the Skylab and Space Shuttle programs. He retired from Space Division in 1984 with 18 years of service.

HODGETTS, PHILIP J., – of Westminster, CA. Bulletin returned, stamped "Deceased." Philip retired from Space Division in 1983 with 31 years of service.

HOLT, ROGER M., 89 – passed away on April 28, 2015. Roger was a design engineer at Space Division. He retired in 1984 with 38 years of service.

HUBBS, ROBERT A., 80 – passed away after a ten-year battle with Parkinson's disease. Bob received his B.S. degree in physics in 1957 and went on to earn a Ph.D. in electrical engineering from Stanford University. He served for more than three decades at Autonetics where he became the Chief Scientist on important Cold War weaponry. He is survived by his wife, Carol.

JOHNSON, MARY E., 93 – of San Diego, CA passed away on July 21, 2015. Mary and her husband, David, came west to California in 1950 and both found employment at LAD. Mary served in Production Control, Planning and Engineering. Mary retired in 1980 with 30 years of service.

KNOX, ARTHUR C., 95 – died on February 5, 2016. A graduate of the U.S. Naval Academy and fighter pilot, Art resigned his commission in 1955 and joined NAA as a test engineer. Over the next 25 years, he progressed from ejection seats to the Apollo Command Module to the Space Shuttle program. He retired in 1980 and is survived by his wife of 69 years, Kathleen.

KRAVITZ, ALVIN S., "AL", 83 – passed away on December 22, 2015 in Brea, CA. After serving in the U.S. Army in Korea, he graduated with an engineering degree from Cal Poly and came to the Reliability Group at Space Division on the Hound Dog, Apollo and Space Shuttle programs. He retired in 1993 from Space Division with 29 years of service. He is survived by his loving wife, Joan.

LONG, RONALD, 79 – of Orient, OH passed away on July 29, 2015. He is survived by his loving wife of 58 years, Nancy.

MICHAEL, RICHARD, "DICK", 85 – died on January 16, 2016. Dick's career in aerospace was capped by the design of the B-1wing. He retired from NAA/Rockwell in 1985 and is survived by his wife of 40 years, Carolee.

MILLER, JOHN S., SR., 89 – of Los Angeles, CA died on December 19, 2015. He retired from the B-1 Division in 1981 with 20 years of service. He is survived by his loving wife of 67 years, Marjorie.

OGLEVIE, ROGER, 82 – of Fullerton, CA passed away on March 1, 2015. Roger retired from Space Division in 1989 with 31 years of service.

PATTERSON, GERALD E., – of Menifee, CA passed away on February 29, 2016. After 38 years of service at Autonetics, Jerry retired at age 55, purchased a motor home and spent the next 14 years touring America with his loving wife, Judy. At his passing, he was a special monitor on buses used to transport "Special Needs Children."

PRUDHOMME, BERT, 85 – of Colorado Springs, CO passed away on April 3, 2016. Bert was a Litton Radar Field Tech employee assigned to the S-II Radar Systems at NAA Seal Beach. He was very cognizant and very proud of his participation in the NAA Space Program. Although not a member of the NAA family, he served with us in life, it is only fair that he should be included with us in the Silent Majority.

SPRATLEY, MELVIN L., 81 – died at home in Chatsworth, CA on April 4, 2016. After obtaining an M.B.A. in Engineering, Mel came to Rocketdyne on the Space Shuttle program. He retired as a manager after 30 years of service and is survived by his wife, Alice.

SZUPELLO, DOROTHY M., of Lakewood, CA. Bulletin returned, stamped "Deceased."

RAUSCH, RALPH J., 87 – of Columbus, OH passed away on September 6, 2015. After serving with the U.S. Army Air Forces' 338th Recon Squadron, Ralph earned a B.S. Engineering degree and joined the NAA Columbus Division. He retired from the Missile Systems Division Computer Lab with 30 years of service.

WATTS, WILLIAM G., 94 – of Downey, CA passed away on February 15, 2016. Bill graduated from Compton College then came to work at NAA for 40 years. He is survived by his wife of 72 years, Zane.

WILBURN, RAYMOND, JR., 85 – of Huntington Beach, CA died on April 22, 2016. He retired from Space Division in 1989 with 35 years of service.

WYATT, JOHN P., 97 – died in Torrance, CA on February 17, 2016. Joining NAA at the Columbus facility, he subsequently transferred to the Tool Design Department at LAD where he served as senior tool designer. He retired in 1981 with 38 years of service and is survived by his loving wife, Naomi.

LOST SHEEP, BULLETIN RETURNED WITH NO FORWARDING ADDRESS

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"The good life is one inspired by love and guided by knowledge."

— Bertrand Russell

NORTH AMERICAN AVIATION
RETIREES BULLETIN
P.O. Box 3797
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North American Aviation Retirees Bulletin
"Where The Best Never Rest"

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Boeing Historical Office via John Fredricson

Boeing Artist Steve Cox depicts the challenging first landing of the F-107 on September 10, 1956. The mission was aborted because of concern about low oil in the engine. The aircraft was heavy with fuel, the flaps were a problem, and the drag parachute failed to deploy. Pilot Bob Baker went off the runway and onto the Rogers Dry Lake bed. The nose gear broke when he hit a wash. Visiting NAA executives who drove out from Inglewood witnessed a bigger show than they wished!

North American Aviation
Retirees Bulletin

"Where The Best Never Rest"

Fall 2016



America's First Women Astronauts

Shannon W. Lucid, Ph.D. Judith A. Resnik, Ph.D. Kathryn D. Sullivan, Ph.D.
Sally K. Ride, Ph.D. Anna L. Fisher, M.D. M. Rhea Seddon, M.D.

NORTH AMERICAN AVIATION
Retirees Bulletin

North American Aviation Retirees Bulletin, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

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Dear NAA Retirees Bulletin Subscriber

After much soul searching, we have decided that this will be our final year of publication. It is ironic that now that we have access to all the North American Aviation historical files at the Boeing historical archives, there are only two of us still standing of the five volunteers that started this project 17 years ago. In the same proportion, many of our wonderful readers have moved on to "Higher Ground" or are in assisted living care and have no further interest in their own history. Now! All the naysayers will come out and say, "We told you! They wouldn't last!" However, we are still not finished. We are completing one final project that we hope to have ready after the first of the year! Each of you that are current subscribers will receive these with our gratitude for your consistent support of our modest efforts. We consider all of you "Part of Our North American Aviation Family" because you are "Family!"

We met Astronaut "Hoot" Gibson last winter and he kindly obliged us with an article dealing with his racing souped-up P-51 Mustangs in the Unlimited Class at the Reno Air Races. In the ensuing preparation of his article, "Hoot" was so amiable, we ventured to ask if his Astronaut wife, Dr. Rhea Seddon, would also favor us with an article? The response was affirmative and the topic to be presented was about the first six women Astronauts in which we present *"Shuttlenauts and Astronettes"* in this issue. Dr. Seddon was a young girl growing up in Murfreesboro, Tennessee when she watched, with her Dad, the Russian *Sputnik* go beeping across the sky. She went on to become an Emergency Room Physician, no small accomplishment for a small town girl. When NASA announced that six women would be admitted into the next Astronaut group, she applied and was accepted! She completed three Space Shuttle missions. Her book, *"Go For Orbit"* serves as an inspiration and should be read by every teenager trying to decide his/her future career path!

Our author/technical speaker/all-around nice guy, Chuck Lowry has come up with another fascinating article. How can a program with 50,000 failures be called a success? Chuck provides some interesting facts which I am sure will stimulate much thought and encourage plenty of conjecture.

Our Larry Korb is back with *"Man's Quest for Flight."* We think that Larry is that Man. We read books about this Quest, Larry writes them.

As to the NAA Memorial bench at the USAF Academy, we believe the Old Colonels have expressed their stone cold feelings in their silence! Nothing we do will change that! Some people grow old while others are born old! Not to worry! Several other USAF sites have learned about our benches and will be pleased to welcome us! As we mentioned before: our test pilot, Wheaties Welch, got airborne that Sunday morning at Pearl Harbor and managed to shoot down several Japanese attackers. It was suggested that he should be awarded the Congressional Medal of Honor. He didn't because he did not wait for the order to take off from his commanding officer! Does anyone remember the name of his commanding officer?

I am using this issue to express my Last Word! Some of you may agree while others may hate it! Since our next issue will be our last—we are leaving some space for you to express your Last Word! So give us your best shot!

May all of you always stand in the light of God's Blessings!



"Why can't we buy just one aeroplane and let the aviators take turns flying it?"

Calvin Coolidge
During his term in office

Shuttlenauts and Astronettes

by Astronaut Rhea Seddon, M.D.

It took a long time for American women to get into space. The "Space Age" began with the launch of the Russian satellite, Sputnik, on October 4, 1957. This event also began what became known as the "Space Race" – the competition for dominance in this new world. The Russians always wanted to be in the lead. Hurriedly, the U.S. launched its first satellite, Explorer 1, on January 31, 1958 and the race was on.

There was considerable concern in the United States that the Russians were ahead of the U.S. in engineering and technology and would somehow take military advantage of their position. Americans were challenged with improving our educational system and training more engineers and scientists for the future of our Space Program. It propelled young people into these subject areas with the goal of someday being a part of something new and great.

Yuri Gagarin began the "manned" space program with his orbital flight on April 12, 1961. The U.S. had selected seven American astronauts for the Mercury program in 1968 and Alan Shepherd made a 15 minute sub-orbital flight on May 5, 1961. It was apparent that the Americans were behind in the Space Race. On May 25, 1961, President Kennedy made his famous speech announcing that the U.S. was committed to putting a man on the moon and returning him safely to Earth before the end of the decade. Over the decade of the 1960s that is exactly what we did, moving well ahead of the Russians – except in one area.

Early in the Russian space program, it was decided that the first woman to fly into space should be from the Soviet Union. Twenty six year old Valentina Tereshkova, a factory worker and amateur skydiver, flew alone on a three-day flight aboard Vostok 6 in June of 1963. None of the other four women with whom she had trained ever flew. It was 19 years before another Russian woman went to space. It was obvious the Russians did not intend to truly include women in their cosmonaut corps.

A group of American women pilots who became known as the Mercury 13 wanted to prove that women should become astronauts. In the early 1960s they passed the physical exams that the male astronaut candidates were given at the Lovelace Clinic in New Mexico. Although all of them had over 1,000 flight hours, unfortunately those hours were not in high performance aircraft and so they didn't meet the requirements for selection. Women were not allowed to fly military high performance aircraft at the time and were not admitted to test pilot schools. Although they fiercely lobbied Congress and the President in 1962 their requests were rejected. It would take more than fifteen years for women to break this sky-high glass ceiling.

The Mercury, Gemini and early Apollo flights proved American prowess in space, culminating in the Apollo 11 landing on the moon on July 20, 1969. Other lunar landings followed then the Apollo-Soyuz joint mission with the Soviets and three Skylab flights by 1974. The next American space vehicle, called the Space Shuttle, had begun its development in the late 1960s and in the early 1970s the final design was complete. A reusable orbiter was capable of carrying a much larger crew of seven – and there was room for a space toilet. Under considerable pressure from the American public, NASA decided to open the Astronaut Corps to women and minorities. In July 1976, over 17 years after the opening of applications for the male Mercury astronauts, an announcement was sent out that qualified pilots, scientists and engineers were invited to apply for the Space Shuttle program. Some called the Shuttlenauts but that title soon faded. Women and minorities were welcome to apply before June 30, 1977. A door had opened.



NASA photo

Jerrie Cobb, a well-known female pilot in the 1950s, flies the Gimbal Rig in the Altitude Wind Tunnel in April 1960 at the Lewis Research Center (now Glenn Research Center) in Cleveland, Ohio. As part of a privately funded initiative, Jerrie Cobb was the first woman to pass all three phases of the Mercury astronaut screening program. However, U.S. Government policy at the time stipulated very specific qualifications for becoming an astronaut, including experience as a military test pilot. Although the women who had volunteered for this private initiative did as well, or better, on the various screening tests than the original seven astronauts, the effort collapsed when it became clear that the Government was not going to overturn the existing list of qualifications to admit any of the women into the astronaut corps.

In all, over 8,000 people sent in applications, 1,544 of them women. Only about half of the applicants met the basic requirements. Two hundred seven of these would-be astronauts were invited to the Johnson Space Center for interviews beginning in late summer of 1977; twenty one were women. Non-pilots would hold the title of Mission Specialist Astronauts.

In August of 1977, I received a life-changing telephone call. NASA was interviewing a third group of twenty applicants – all life scientists. The two earlier groups had been of test pilots – all male. There were eight very well qualified women in the group. The week-long trip to Houston would include

extensive physical exams, briefings on the Mission Specialist job, and a 90 minute interview. We arrived at the Center on Sunday afternoon and to my surprise since I had learned little about what this new job would entail, my interview was on Monday morning. This officially made me the first woman to be interviewed for the Astronaut Corps.

The Selection Board was made up of astronauts and a few male NASA managers. Dr. Carolyn Huntoon, head of the biochemistry lab, was the sole woman and Dr. Joe Kerwin, a physician astronaut who had flown on a Skylab mission, was the only life scientist. I had the feeling they weren't sure what to ask scientists – or women. But then, I had no idea how to best answer their questions so I just had to be myself. We had a pleasant hour and a half with no idea how I had done. The physical exam was extensive but I passed all the tests.

Much to our dismay, there was an insane amount of media interest in the women in this group. Wanting to be treated like our male colleagues, it gave us a brief look at what being a female astronaut would be like.

On January 16, 1978 NASA announced that a class of 35 astronauts had been chosen including six women. I was one of them.

Because of all the press interest in the women, the men jokingly referred to our group as "the six women and the other 29." Other unflattering (sometimes ridiculous) terms for women astronauts surfaced. Would we be known as Astronettes or Space Ladies or what? One jokester suggested we be labeled the Non-men Astronauts. Insisting that we wanted to be considered part of the group, our class became the "Thirty Five New Guys" or TFNGs.

We were a diverse group: Anna Fisher and I were M.D.s, and Sally Ride, Judy Resnik, Kathy Sullivan, and Shannon Lucid, all Ph.Ds. We knew there would be considerable interest in how we would perform. We had heard that some of the 27 astronauts already in the office were not in favor of including women. However, I personally never felt we were discriminated against. We six all knew we would have to form a group to support one another – and we did.

Our first year of training was arduous – both physically and mentally. Since Mission Specialists would be flying in the back seat of the NASA jets, the first order of business was aviation training. There was ground school, ejection seat briefings, water and land parachute training (using parasails), physiologic training and lessons on T-38 communication and navigation systems. Finally, we began a NASA syllabus of flight training. As we began traveling about the country, Air Traffic Controllers were confused to hear female voices coming from NASA jets. I had my private pilot's license in small single engine planes so it was quite a change to be going almost supersonic at 41,000 feet. But I got to log jet co-pilot time.

Soon we started our "technical training." First there were lessons on Orbiter systems, then shuttle flight and mission operations. Since many space walks were planned, Extravehicular Activity or EVA training began. This included SCUBA training in a pool, then progressed to exercises in a huge water tank in the space suits. This was when I found that I was too small to fit into the smallest of the suits and so was not eligible for EVAs – but there were plenty of other jobs on Shuttle missions.

Next we had training in all the scientific fields that were being proposed for NASA payloads. That included geology, earth observation, life and material sciences, astronomy, and so on. Most exciting we had lectures about the early days of the Space Program, many of them by former astronauts like Neil Armstrong, Jim Lovell and Alan Shepard. These men had been our heroes growing up.

Then we were given our first Technical Assignments. This was really on-the-job training. At first we would shadow the older astronauts, then we'd be given an assignment to work in a particular area of Shuttle development or operations. Some of these jobs were in areas we knew little about but needed to learn. Others were in areas that reflected our expertise to which we could make a contribution. In a way, it revealed where each of the new astronaut trainees stood in the pecking order. Some were sent to work on EVA, some to be CAPCOMs in Mission Control (although the Shuttle wasn't flying, there were crews training), some to the Kennedy Space Center to work on shuttle itself, which were all plum assignments. I was sent to work on the food systems. I had done some research in nutrition – still, it felt a little sexist. I took advantage of the opportunity to do extra work learning all the systems that supported the galley in the Shuttle and made the most of the short term assignment.

After a year in September of 1979, it was decided that we had completed enough initial training and our services could be used best by helping to get the first Shuttle flights and crews off the ground. The first six crews had been named from the astronauts who had been in the office during the Apollo days.

All of the TFNGs wondered when members of our class would be assigned. In the meantime, we supported the



NASA photo courtesy of Dr. Rhea Seddon

NASA Group 8 – the "Thirty-Five New Guys"



NASA photo courtesy of Dr. Rhea Seddon

Five of the six first American women astronauts in the U.S. space program take a well-deserved break from various training exercises during their water survival training course at Homestead AFB in Florida in August 1978. From left to right are: Sally K. Ride, Judith A. Resnik, Anna L. Fisher, Kathryn D. Sullivan and M. Rhea Seddon. Not pictured: Shannon W. Lucid.

upcoming Shuttle flights. I was assigned to head up a team of Astronaut physicians who would assist the Search and Rescue teams that would be deployed for the first four flights. For these flights, called the Orbital Test Flights, the two man crews would have ejection seats. Many possible emergency scenarios were practiced – a return-to-launch-site abort that either crashed near Cape Canaveral or ran off the runway in Florida into the moat around the landing zone, a crash near the intended landing runway at Edwards Air Force Base, or a bail out over the Atlantic or Pacific. Rescue forces were standing by and the astronaut physicians were assigned to provide expertise about the Shuttle and the suits worn by the crewmembers. Having never been part of a helicopter crew with Vietnam-experienced parajumpers as my assistants, it was a most interesting assignment.

On April 12, 1981, exactly 20 years after the first man, Yuri Gagarin, flew in space, *Columbia* gracefully lifted off from Cape Canaveral in Florida. After two days in orbit, it landed safely on the dry lakebed runway at Edwards AFB in California – the first reusable space vehicle was a success. In early 1982, it was decided that it was time to assign larger crews after STS-6. On April 19, 1982 the first of the 1978 group, the TFNGs, were assigned to STS-7.



NASA photo courtesy of Dr. Rhea Seddon

Astronauts Rhea Seddon and Robert "Hoot" Gibson prepare for a flight in a NASA T-38 supersonic trainer.



NASA photo courtesy of Dr. Rhea Seddon

NASA's first six women astronauts stand with a mockup of a personal rescue enclosure (PRE) or "rescue ball" in the crew systems laboratory at the Johnson Space Center in Houston, Texas. The PRE was designed as a possible means of transporting astronauts in the vacuum of space from one Space Shuttle orbiter to another in case of an emergency. The PRE only reached the prototype stage in development and never flew on any Space Shuttle mission. The mission specialists from the NASA Astronaut Group 8 are, from left to right: Rhea Seddon, Kathy Sullivan, Judy Resnick, Sally Ride, Anna Fisher, and Shannon Lucid.

In order of our assignment to flight, here are the stories of the first six women astronauts:



Sally Ride was from California, her father a professor and her sister a minister. Brilliant, she attended a fine private high school and was a nationally ranked tennis player as a teen. She was a staunch feminist. Mike Mullane (author of the hilarious book *Riding Rockets*) was one of the clueless males in our class who often ran afoul of Sally. In 1982, she was the first female to be assigned to a flight. There were many decisions to be made about how women would be treated and accommodated on the flights and Sally involved all of the other women astronauts in addressing issues that came up. The pressure on her from the media responsibilities was daunting and while Sally handled it well, she did not enjoy it. At times, she merely declined to participate and sometimes she tried to be invisible. There was the time she was asked to be on a Bob Hope show. Because she didn't like the way women were portrayed on that show, she merely left town for a few days. She flew on STS-7 in 1983 and on STS-41-G in 1985 and left NASA in 1987. She served on the accident boards investigating the crashes of both *Challenger* and *Columbia* shuttles, became a professor at the University of California, and founded Sally Ride Science to inspire young women to study science. Unfortunately, she died of pancreatic cancer at age 61 in 2012.



Judy Resnik or "JR" as she preferred to be called, was kidded about being a Jewish American Princess although she was not religious. Clever and flirty, she was really good at giving a cute comeback when kidded by one of the guys. She was the second of the women to be assigned to a flight. On the first launch attempt of STS-41-D in 1984, she was aboard *Discovery* when the shuttle main engines were shut down seconds before launch – but flew two months later. The flight experienced a toilet failure and the crew had to improvise. The men found that urinating into a plastic bag didn't work well unless there was something to absorb the liquid. All the socks that had been stowed onboard were soon put to use. It was not so easy for JR, but she managed. Early in the flight she had great fun letting her luxurious long curly hair float free – until it got caught in a large camera. She made the flight commander promise on threat of death that he would not report it to Mission Control. Sadly, her second time to fly was on the *Challenger* flight that exploded 73 seconds after lift-off.



As for me, on May 30, 1981 I married a fellow TFNG, Navy fighter pilot Robert Gibson, known by all as "Hoot" after the cowboy movie hero of the early twentieth century. When we found I was pregnant in late 1981, we kept it a secret. It was a good thing we did tell everyone the next March so I could be taken out of consideration for the flight assignments that were made in 1982. My first child, Paul, was born in July 1982 as Sally was beginning her flight training. I felt I had the better deal. It was an honor to be the third of the women to be added to a flight crew. I was to fly in mid-1984 but that flight was canceled and we were moved first to one, then a second flight in 1985. We finally lifted off on April 12, 1985, on the twenty-fourth anniversary of the first human in space and the fourth of the first shuttle launch. One of the satellites we deployed failed to activate and our crew, with a spectacular planning effort by fellow astronauts on the ground and Mission Control, had to perform an unplanned spacewalk, rendezvous and robot arm operation to flip a switch on the side of the huge satellite that was floating out our window. We accomplished all our tasks but the satellite didn't activate and a crew on a later flight rescued it. My second and third flights were Spacelab missions dedicated to life science research. Both were dream jobs for me. I had my second child before my second flight and my third after my third mission. I also served as an "astronaut spouse" for Hoot's five missions. It was a busy life! I retired from NASA in 1996 to become the Assistant Chief Medical Officer at the Vanderbilt Medical Center in Nashville, Tennessee, and then became a founding partner in LifeWings Partners LLC, which teaches teamwork to healthcare organizations. In 2015, I published a memoir about my NASA career.



Anna Fisher, the fourth of us to be assigned to fly, was the most like me. She was an emergency room physician who grew up in California and had been in the group that had interviewed with me. She married Bill Fisher, a physician who had also applied to the program, just days before her interview. Bill joined our office with the 1980 class. Anna got pregnant right after my baby was born and it was impressive to see her working at Cape Canaveral preparing shuttles to fly in an oversized borrowed flight suit as her belly expanded. Her first child was born almost exactly a year after my son. She made her first flight just 16 months later. On that flight, STS-51-A in November of 1984, she helped retrieve two satellites that had failed on my husband's first flight. Because my first flight had been delayed, Anna became the first astronaut mom in space. With the birth of her second child in 1989, she took a leave of absence to raise her family. In 1996 she returned to work on the development of the International Space Station and she is now an astronaut manager. She is the only one of our group of first six women astronauts to still be in the Astronaut Corps.



Next to be assigned was Kathy Sullivan who called California home. An oceanographer and geologist by training, she was tall, athletic and very smart. It was clear to all of us that she would be the first female astronaut to do a spacewalk. She was assigned to fly on STS-41-G to launch in October of 1984. (Not to be outdone, the Russians hurriedly launched cosmonaut Svetlana Savitskaya who did a spacewalk in July of 1984.) She and crewmate Dave Leestma demonstrated the feasibility of satellite refueling from the shuttle. She flew two more missions, the

second of which was a Spacelab flight called Mission to Planet Earth. She left NASA in 1993 to become president of a science museum in Columbus, Ohio. In 2011, she went to work for the National Oceanic and Atmospheric Administration, becoming the Administrator in 2014. She demonstrated extraordinary leadership skills in all three of her careers.



Shannon Lucid was the last of our group to be assigned to flight – but she ended up with more flight hours and years at NASA than any of us other six. A biochemist from Oklahoma, she flew on four shuttle missions (one with me, STS-58, Spacelab Life Sciences 2). One of the most arduous duties astronauts were assigned in the 1990s was to go to Russia to train for a mission on the Russian Space Station *Mir*. It entailed a year of language and flight training in Russia culminating in five months in Earth orbit. Launched on a Soyuz rocket in March of 1996, Shannon settled in with her two Russian crewmates with her usual cheerfulness and determination. Unexpectedly, the mission was lengthened by six weeks and she set a single-mission spaceflight endurance record of 188 days on the Space Station *Mir*. Combined with her 35 days on shuttle missions, she far exceeded the flight time for the rest of us six. She retired from NASA in 2012 at 69 years of age after almost 34 years as an astronaut.

This group of women were diverse in education, personality and career paths, but all were determined to prove that there was a place in space for women. During our careers at NASA more women were selected for the astronaut program – women from different races, women with different skill sets. Eileen Collins became the first woman to command a shuttle mission. Women were promoted to other roles within NASA. There were women flight directors in Mission Control, women leaders of directorates and now a woman Director of the Johnson Space Center, Dr. Ellen Ochoa. The first six of us opened the door for them and for other women who seek to reach for the stars!

About the Author: Dr. Rhea Seddon, one of the first six women to enter NASA's Astronaut Program in 1978, served as a Mission Specialist on missions STS-51-D and STS-40 and as Payload Commander in charge of all science activities on mission STS-58. Following her 19-year career with NASA, she was the Assistant Chief Medical Officer of the Vanderbilt Medical Group in Nashville, Tennessee for 11 years, where she led an initiative aimed at improving patient safety, quality of care, and team effectiveness by the use of an aviation-based model of Crew Resource Management. She was a founding partner of LifeWings Partners LLC which teaches this concept to healthcare institutions across the nation. In 2015, Rhea was inducted into the U.S. Astronaut Hall of Fame. She is married to fellow Astronaut Hall of Fame inductee Capt. Robert "Hoot" Gibson. They have four children and reside in Murfreesboro, Tennessee.



Visit
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of Go For Orbit today!

GO FOR ORBIT

by Astronaut Rhea Seddon

In a small town in Tennessee, the young girl stood with her father and gazed at the Russian Sputnik in the night sky. She knew that she was witnessing the beginning of a new era for the human race. Would she play a part? Rhea Seddon was ten years old.

As years went by, humans ventured off the planet and walked on the moon. The astronauts were men but she felt that would change. At Berkeley in the tumultuous late 1960s, in medical school and a surgery residency she learned that the world no longer belonged solely to males. When NASA announced a selection of new astronauts for the space shuttle program in 1977, she knew: this was her chance.

As one of the first female astronauts in 1978 her quest for space began. But she would do this job her own way, blazing a new path for others to follow. Venturing into space on three spectacular missions, working on important projects for NASA, weathering the storm of Challenger, marrying a fellow astronaut, and bearing Astrotots, that child who looked skyward long ago is an inspiration to all who aim high to find their own orbit.

Finding Success Among the Failures

by Charles H. Lowry

How can a program with over 50,000 failures be called a success?

That was Apollo. How did we ever get to the Moon and back with that astounding number?

I'm sure we can all agree that Apollo was hugely successful. But if you worked on Apollo, you knew getting to the Moon was a rocky road. So it is for any complex, cutting-edge program.

What about these 50,000 plus failures? They were mostly individual piece-part/component failures. Those that kept an army of people scrambling to do failure analyses, corrective actions, retest requirements-and convincing the program and customer that we are still on track. One could ask-did we get to the Moon because of good parts, or did we get to the Moon in spite of bad parts?

We had big failures too—like Apollo 1 and Apollo 13. Plus, we had a number of significant potential show-stoppers during development like blowing up a service module tank in the pit and sinking B/P 28 after a water landing test.

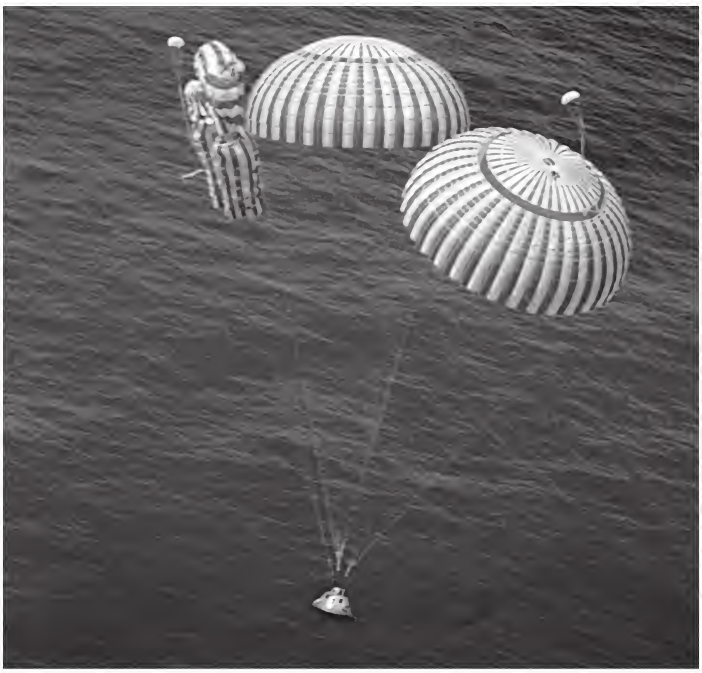
There were many in-flight anomalies, mostly forgotten by now but interesting to look back upon. Like the Apollo 14 docking probe and Apollo 15 parachute/RCS conflict.

But still, we successfully carried out the President's edict to land men on the Moon and bring them home safely in the decade of the 1960s. We didn't do badly in regards to the budget, either.



NASA Photo

***The damaged Apollo 13 Service Module (SM) was photographed from the Lunar Module/Command Module following SM jettisoning. An entire SM panel was blown away by the apparent explosion of oxygen tank number two located in Sector 4 of the SM. The damage to the SM caused the Apollo 13 astronauts to use the Lunar Module (LM) as a "lifeboat." The Lunar Module* "Aquarius" *was jettisoned just prior to Earth reentry by the Command Module* "Odyssey."**



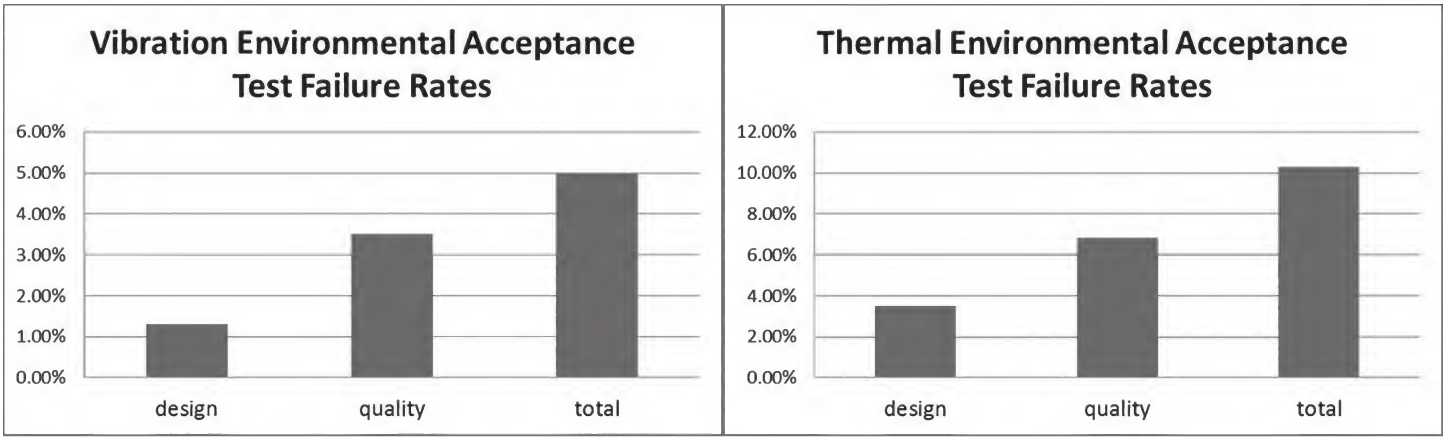
NASA Photo

The Apollo 15 Command Module* "Endeavour" *nears a safe touchdown in the mid-Pacific Ocean. Although causing no harm to the astronauts, one of the three main parachutes failed to function properly.

Back to the part/component discussion—there were over 20,000 firms and over 250,000 people working on the Apollo program-many producing flight parts like valves, wiring, instruments, tanks, materials, uprighting bags, etc. All these were on contract to furnish "space rated" parts-parts that met high standards in terms of quality and reliability. Manufactured parts were required to be built to highly controlled standards, inspected, and typically subjected to defined acceptance tests to verify that they were good parts-and ready to go to the Moon. But early in the program it became evident that across-the-board failure rates were excessive. Parts were being received and installed, only to find that individual part failures kept our systems build-up and check-out processes in low (or reverse) gear.

In the wake of the Apollo 1 fire, a major effort was launched to significantly improve part/component quality/reliability. Additional and more stringent acceptance tests were defined for the Command/Service Modules (CSM) and the Lunar Module (LM). The objective was to weed out weak parts early. This move proved hugely successful.

Specifically, part/component acceptance tests were redefined to include vibration and thermal exposure tests, and were renamed "Environmental Acceptance Tests." Each part type was individually judged as to what exposure would be most appropriate for it, and factors such as sensitivity, inspectability, and criticality were considered. Obviously, the severity of exposure to vibration and thermal levels had to be carefully defined so as not to overly stress and thereby degrade parts that were going into the flight vehicles. Development testing of many types of parts established levels necessary to detect weak parts without being too severe.



Environmental Acceptance Tests

The charts above show results of a large number of these Environmental Acceptance Tests (NASA SP-287). The left hand table shows failure rates during vibration exposure of 11,447 parts of 166 different types. Roughly 5% of those parts failed, mostly for reasons of workmanship. The right hand table shows similar data from thermal exposure or thermal cycling of 3,685 parts of 127 types. Roughly 10% of these parts failed, again mostly for reasons of workmanship. The large numbers of tests under controlled and standardized conditions produced data of statistical value that allowed meaningful interpretation of underlying factors. The majority of these failures were found in electrical/electronic parts and were "material and processes" in nature. The startling realization was that these parts had been delivered as "space rated" parts, ready for installation, checkout, and on to the Moon!

The inclusion of these Environmental Acceptance Tests was of extreme value in terms of maintaining program schedules and conducting successful missions. One measure of value was to log data on how many "escapes" occurred-that is, how many parts successfully passed Environmental Acceptance Tests and subsequently failed in checkout or flight. For the CSM, it was only 3. (For Shuttle, it was 8.) Not bad!

On the Apollo CSM Program, a significant percentage of the effort and cost went to providing mission abort capability. The entire Launch Escape System with its 6 launches at White Sands Missile Range, plus all the associated mission planning and crew training were major efforts to provide this means of crew survival in case of booster or trajectory problems. And, of course, we never had such an abort, but was important that the necessary capability be there.

We did have a number of failures/anomalies in flight. The chart below (NASA SP-287) shows a tabulation of component failures for certain CSM and LM missions. Notice there is no downward trend in the reported failure rates that one might expect from continued usage and on-going scrutiny of parts/systems as more launches occur. Perhaps the answer can be found by (over-simplifying and) considering that if we have around 2 million parts in the vehicles-and if one assumes each part has a reliability rating of 0.99999 (can't average much better than that), then we would expect and predict around 20 failures per flight. That's not far from what we experienced!

Mission	CSM	LM
Apollo 7	22	—
Apollo 8	8	—
Apollo 9	14	12
Apollo 10	23	15
Apollo 11	9	13

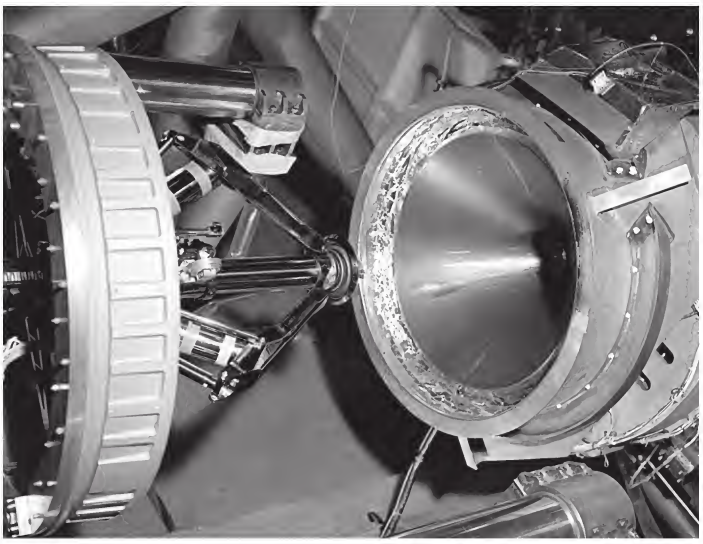
Documented In-Flight Anomalies

That says with such a huge number of parts on board, we cannot avoid several part failures on every mission, and we must prepare for that reality. Apollo did that masterfully, as evidenced by our many successful missions that overcame numerous in-flight anomalies. This was done by providing prudent component/system redundancy, stringent reliability-related activities, extensive flight crew and ground support training, and well thought-out procedures.

Of course, not all anomalies were due to parts failure. Some notable ones were caused by external influences-such as the collapsed main parachute on Apollo 15, referred to earlier. After a successful lunar landing and return to Earth's atmosphere, the cluster of 3 main chutes was observed to be fully inflated and descending properly. Midway through normal descent, suddenly one main chute collapsed and the Command Module descended to a safe, but rather hard landing with only 2 chutes. Investigation showed that early in the descent, the RCS was expelling surplus fuel (Hydrazine), and as it exited the hot RCS nozzles it was picking up oxygen from the air. The result was flaming globules of fuel (balls of fire) drifting up through the main chute cluster, severely damaging one of the chutes. Maybe we were lucky—it could have burned away 2 or even all 3.

This Apollo 15 experience was a case where really nothing failed—the two systems worked flawlessly but one system interfered with the other with near disastrous results. There was nothing the crew could do except grit their teeth and prepare for a rough landing. All ended well and the program learned more of the importance of scrutinizing possible "Intra-system" effects.

Let's look at Apollo 14 for an interesting study in part/system failures/anomalies. Since Commander Alan Shepard had been returned to flight status after several years of health problems, he was highly determined to lead a successful lunar landing mission—nothing was going to stop him. But soon



NASA Photo

An engineering set up of the docking system of the Apollo spacecraft. The docking probe on the Command Module (left) engages the cone-shaped drogue of the Lunar Module (right). The docking structure forms a tunnel through which the astronauts transfer from the Command Module to the Lunar Module. Following CSM/LM docking, the drogue and probe are removed to open the passageway between the modules.

after launch and trans-lunar injection, the crew was unable to conduct the first CSM docking with the LM. Five tries where the Apollo docking probe head was driven into the LM cone-shaped drogue failed to produce capture, or "soft" docking. The probe head had 3 spring-driven capture latches that should have engaged with the drogue, so that the probe could retract and pull the two vehicles together for a "hard" docking. So with the ground support training, preparation, and knowledge, a "brute force" procedure was worked out in real time. And with the flight crew's determination, docking was successfully accomplished on the sixth try—which salvaged the mission.

But solving the docking problem did not mean that all was well on the Apollo 14 mission. Upon separating (undocking) the LM from the CSM in preparation for lunar descent, a warning light in the LM indicated a circuit problem that would not allow arming the automatic LM abort system. This system would safely deliver the crew back to the safety of the CSM had the LM gotten into an unsafe situation prior to landing—and was mandatory for "go" for descent. Tapping the arming switch indicated some kind of intermittent condition, like perhaps a loose solder ball.

So Mission Support rounded up a person from home that quickly created and uploaded code that would bypass the errant circuit and allow normal descent. Great news, but one more problem awaited them. During descent, the landing radar did not arm when the switch was thrown—another mandatory system. After considerable troubleshooting, they were able to clear the problem by cycling the breaker. Successfully dealing with problems of this nature in real-time was due to extensive understanding of the hardware/software, preparation, training, and having the right people on standby.

Since Apollo 14 immediately followed the Apollo 13 failure to land on the Moon, severe political consequences would doubtlessly have hit the program had this lunar landing not been successful.

Did other programs of that day have comparable levels of anomalies and failures? The A-12/SR-71 program was under active development and operation roughly coincident with Apollo. They lost 20 aircraft over a period of 25 years. By one count, 11 of those 20 losses were caused by system malfunctions. And referring back to Apollo's 50,000 parts failures, this failure rate was reported to be 4 times improved, compared with Mercury. So yes, complex programs do and will have failures.

Much can be learned from a successful program as huge and as well documented as Apollo. After completion of the Apollo program, several excellent documents looked back and summarized various important aspects of the program. George Low (NASA SP-287) summarized the "3 basic ingredients" of Apollo's success: spacecraft hardware that is most reliable, flight missions that are extremely well planned and executed, and flight crews that are superbly trained and skilled. Then he added—attention to detail and personal dedication. Certainly all of these points played into the ultimate success of Apollo 14 and, indeed, all the missions.

J. H. Levine (AIAA 70-375) provided other valuable insights into the value (or not) of some of the program analyses we, grudgingly, spent a lot of time on. He said that FEMA/CILs and fault trees were good for identifying critical parts and functions and for providing basis for many kinds of critical, real-time decisions. But they were limited by analysis of what we thought could fail. He also said that numerical reliability predictions did not predict failure rates well (indeed, this was discontinued on much of the Space Shuttle program).

Mr. Levine continued by saying we were right by generally requiring qualification testing of 2 units of each design—one for design limit testing and the other for mission life testing. He added that testing at higher levels of assembly was highly advantageous if the proper environments could be achieved. Finally, he said post-test teardown and inspection was generally valuable, whether a failure had occurred or not. Summary comments like these are invaluable for the many important programs that followed Apollo, and those of today.

Aerospace programs today look back on Apollo as the trailblazer for superior technical management of complex programs. Environmental Acceptance Testing is routinely done today and some observers feel it is actually overdone—at a cost. And certainly NASA and commercial manned spacecraft programs draw heavily from Apollo experience, seeking excellence and efficiency in their current programs.

Those at NAA and Rockwell can take much pride in having a major role in that Apollo landmark program.

About the Author: Over the years, Chuck Lowry has become a well-known author to readers of the NAA Retiree Bulletin. He is deeply appreciated here at the Bulletin because he is the "Go To" person when there is a problem! Whether the call is, "Chuck, we need a three page article for the next issue and we need it yesterday" or it is "Chuck, we need a technical speaker for the USAF Academy. Can you make it?" Being a member of the North American Aviation family, the answer was always "Yes!"

Man's Quest for Flight

by Larry Korb

The Beginnings

Life apparently started in the oceans, for God made it easy to survive by moving away from danger. First of all, fish did not have to fight gravity as the later land animals did. Fish have a bladder, which they could fill with air or discharge air, allowing them to change depths by changing their buoyancy. As a result, they need much less oxygen and can survive by using their gills to extract the oxygen dissolved in the seawater, which is only 5-8 parts per million. Fish could also move more than 20 feet in a second with a mere flap of their tails. They could maneuver so easily! Animals migrated to land as the oxygen atmosphere arose to about 21% of the atmosphere or 210,000 parts per million. We needed so much more oxygen because we were often fighting against gravity.

Those animals on land did not have it so easy. They could jump into the air a few feet, temporarily fighting gravity for a split second. They could also climb a hill or steps, but many puffed heartily if the number of steps or the hill was too high, for gravity was the burden for living ashore.

Ancient men marveled at the birds that could seemingly take off into the air with a jump and a flap of its wings. They knew that objects heavier than air could fly. Birds could soar for hours, barely flapping a wing as they searched for prey from above.

Every year, millions of monarch butterflies, born in the fall of the year, migrate nearly 3,000 miles from Canada and United States to central Mexico to mate. Along the way, they have to fly across the mountain peaks. (It's hard to believe they can even have sex after this horrendous journey.)

Birds, such as the Sooty Shearwater have been tracked electronically flying a total migration distance of 40,000 miles, whereas bar-headed geese have been seen flying at an altitude of 29,000 feet, the height of Mount Everest. Man has tried not to be outdone! Throughout his history he has searched for ways to get airborne.

Kites

Perhaps the earliest recorded flight by man occurred in China in the decade of 550-559 AD, when Chinese Emperor Kao Yang carried out the systematic extermination of the T'opa and Yang families, massacring 721 of them in the last year of his reign. He had them thrown from the 100-foot Tower of the Golden Phoenix near the city of Lin Chang, after being harnessed to great bamboo mats for wings and allowed to fly to the ground. Gravity took care of the situation and all died.

Later, he had them jump as test pilots for large kites. One of these, the Prince of Wei, a member of the Yuan family, succeeded in flying his kite as far as the Purple Way, reputed to be over a mile distance, and then came to Earth alive. But rather than rewarding him by sparing his life he was handed over to the President of the Censorate, who had him starved to death. The Chinese discuss the use of manned kites for spying on enemy formations in the 6th century AD. Marco Polo recalled that Chinese ships, when getting ready to sail, had men put on willow kites, which were flown in the wind by the crew. If they rose out of sight, the sailing trip would be successful, but probably not for the kite pilot!

Hot Air and Helium Balloons

For the next 1,223 years, the kite was the only way man could break the gravitational umbilical to the Earth's surface. Then, in 1782, a couple of French brothers, Joseph and John Montgolfier, filled a silk bag with hot air and noticed it was lifted to a high ceiling. It was an example of using buoyancy, just like the fish do. If the bag and its internal gas weighed less than the ambient air, it would rise. I think most people at that time knew hot air is less dense and does rise, especially if they observed the flames rise from a burning fire. But the Montgolfiers were visionaries and they sought to exploit this observation. What better way to do it than make a much larger spherical bag and fill it with hot air from a fire and send up several farm animals in a basket beneath it! And so they did on April 26, 1783. It was very successful!

Apparently, the word had spread around and a French scientist, Pilatre De Rozier, launched a hot air balloon on September 19, 1783, containing a sheep, a duck, and a rooster. It stayed in the air for 15 minutes, before it came crashing to the ground. The Montgolfier brothers built a 70-foot diameter balloon, made of linen and paper lined, launched it at the Bois de Boulogne in Paris on November 23, 1793. It carried Pilatre de Rozier and the Marquis d'Artandes. The balloon rose to approximately 3,000 feet, remained aloft for 25 minutes, and traveled an estimated 5 miles. De Rozier became famous as the first hot-air balloonist but did not enjoy his fame for long.

Two years later, a French balloonist, Jean Blanchard, along with an American co-pilot, Dr. John Jeffries, became the first to fly across the English Channel. On his first trip, he added a hand-powered propeller and on his second trip, he added flapping wings. I don't think either helped his voyage.

That same year, de Rozier tried the same trip using a hydrogen balloon tied together with a hot-air balloon. While he knew hydrogen is about 1/14th as dense as air and the most efficient gas for filling balloons, apparently he didn't adequately address its combustibility. Five miles out, the balloon exploded and he died. Meanwhile, Jean Blanchard, some 8 years after successfully crossing the English Channel, brought ballooning to America and George Washington watched the launch. Accordingly, interest in ballooning has been continuous for the last 233 years. The use of hot air is still common for balloon trips carrying passengers for recreation but the use of helium, ~1/13th the density of air, is commonly related to scientific and commercial applications.

Hot-air ballooning has changed over the years, for many years the fuel for heating it was "anything that burns'" and consisted of paper, twigs, stalks, and straw. It wasn't until the 1853 that Abraham Gesner derived a flammable liquid from waxy hydrocarbons (called kerosene, after the Greek word for wax). Note that kerosene is the fuel used for first stage rockets, such as the Saturn V, and is called RP fuel. In spite of fuel limitations, altitudes of 13,000 feet were achieved just a year after the hot-air balloon was introduced and an altitude of 23,900 feet was achieved some 20 year later. Today, hot-air balloons use propane heaters and gas temperatures reach just above the boiling point of water (212 °F) and today's balloons are made of nylon or dacron fabrics. The world's altitude record for a hot-air balloon is 68,986 feet.

In 1978 the *Double Eagle II* became the first balloon to cross the Atlantic Ocean and was helium filled. Three passengers made the trip in a record 137 hours. In 1987, Richard Branson and Pier Lindstrand crossed the Atlantic in a hot-air balloon. They flew 2,900 miles in a record breaking time of 33 hours using a gigantic 23 million cubic-foot balloon. The same team flew across the Pacific Ocean in a hot-air balloon and traveled 6700 miles in 47 hours. In 1999, the first round-the-world balloon flight was made by Bertrand Piccard and Brian Jones in 19 days, 21 hours, and 55 minutes; again in a hot-air balloon.

The altitude record for a gas filled balloon is 128,100+ feet set on October 14, 2012 by Felix Baumgartner, who took it up for the world's highest parachute jump, but the record will not be accepted—he didn't return with the balloon to Earth. During his jump, he exceeded the sound barrier (Mach 1.24 or 833.8 miles per hour), and was subjected to temperatures of -70 °F. Strangely enough, it occurred on the 65th anniversary of Chuck Yeager's X-1 flight, which first broke the sound barrier. Baumgartner, an Austrian, had made more than 2,500 parachute jumps at that time.

Hot-air ballooning continues to be an exciting recreation for many in this country and more than 600 balloons show up annually at the Albuquerque International Hot-Air Balloon Fiesta.

Perhaps, the major disadvantage of hot-air ballooning is that you can control the flight in only one direction, the altitude. Otherwise you are at the mercy of the winds. You can rise to various altitudes to find a favorable wind, but usually the balloonist is in radio contact with a ground crew regarding where the balloon eventually will be landing. In addition, it takes a crew of 4-5 people to handle the balloon when it is being inflated and it can't be launched in winds exceeding five to 10 miles per hour. An experienced crew can have it in the air in 10-15 minutes. After landing, the balloonist has to fold and repack the balloon on a trailer.

Airships

Airships are a family of lighter-than-air (LTA) crafts that are propelled through the air in a horizontal direction. Generally, they are classified in 3 families: dirigibles, semi-rigid airships and blimps. They are generally cigar-shaped to aid in their forward motion and contain a vertical fin, and a small horizontal stabilizing wing-like structures on the tail end.

A dirigible has a structure in which gas-filled tank cells carry the lifting gas and the exterior skin is supported by these structural members.

A blimp has essentially no structural members and the skins are shaped by air pressure. It can be collapsed and transported as necessary. Because it is often necessary to add a flight control compartment to the underside (gondola), to which engines are attached, the semi-rigid airship has a keel to take the engine and gondola loads, but internal pressure shapes the skins. Actually, it was Baptiste Henri Jacques Giffard who made the first dirigible and launched it on September 24, 1852 (before the American Civil War) and made a flight of nearly 17 miles from Paris to Tappes. He was able to steer and turn the powered ship, but could not return because the wind was too strong on the return trip for his 3-horsepower, propeller-driven steam engine. The dirigible's steam engine weighed over 400 pounds. The dirigible was filled with hydrogen. There were many developments during the period from 1852 to 1900.

A Zeppelin is a dirigible built by the factory of Count Ferdinand von Zeppelin, who is considered the father of rigid air ships in that he perfected the dirigible in 1900. For power he used a propeller driven by the recently invented light gasoline engines and the newly developed lightweight aluminum for structure. The Zeppelin was the gold standard for many years. The *Graf Zeppelin*, certainly one of the most famous dirigibles, flew passenger from Frankfurt, Germany to Recife, Brazil from 1928 until 1937. What was the advantage? It was more than 2-1/2 times as fast as an ocean liner and was remarkably safe. The *Graf Zeppelin* traveled 990,000 miles without a passenger accident. It was 2-1/2 football fields long, 100 feet in diameter, and had a hydrogen gas capacity of 2,650,000 cubic feet and also had over a million cubic feet of blaugas (similar to propane) for fuel. It had almost 192,000 pounds of lift, and 5 engines of 550 horsepower each. It made 590 flights, flew 17,200 flight hours and carried a total of 34,000 passengers of which most were the flight crew (13,100 paying passengers). It also made the first round-the-world airship flight.

The *Hindenburg* Zeppelin was even larger. With a gas capacity of nearly 7,100,000 cubic feet, it was 2-2/3 football fields long and 135+ feet in diameter. It had a lifting capacity of 512,000 pounds, a cruising speed of 76 mph, and four 16-cylinder Daimler-Benz diesel engines, and was manned by a flight crew of 40 officers and men. It had 72 passenger sleeping berths. On May 6, 1937, minutes before approaching the mooring mast in Lakehurst, New Jersey, the tail caught on fire, burst into flames and the dirigible crashed. A total of 97 people were on board and 37 died. That was the death knell for hydrogen filled airships, and the next day the *Graf Zeppelin* was also taken out of service.

Hydrogen was easily obtained by reacting zinc or iron with sulfuric acid. Helium, the second lightest gas was in such short supply at that time that the two U.S. Navy dirigibles, the *Macon* and the *Shenandoah*, in 1923, had to operate one at time, sharing the helium gas, which at that time was most of the world's reserves.

Are there any other light gases that could be used, other than hydrogen, helium, and hot air? Yes, any gas that has a molecular weight of less than 29 (average molecular weight of air) could be used. Hydrogen can lift 71 pounds per 1,000 cubic feet, whereas helium can lift 66 pounds and steam can lift 39 pounds per 1,000 cubic feet. Other light gases such as methane, carbon monoxide, and ammonia, as well as hydrogen sulfide could be used, but all of these are flammable and many are toxic. If a dirigible filed with hydrogen sulfide blew up, it would raise a major stink! Even steam could be used, but you would have to keep it from turning to liquid in the upper atmosphere. The highest flight made by the *Graf Zeppelin* was 5,500 feet, but pressurized airships did reach 8,000 feet. Airships can be designed to attain some lift when traveling forward (up to 10% of the static lift capability).

As an offensive weapon, airships were useless. In World War I they were used to bomb London, but the cloud cover and poor bombing accuracy made them impossible to justify. But as a defensive weapon, they were superb. In the early days of World War II, German subs sank some 532 unescorted ships near the U.S. coast. By escorting ship convoys, the blimps dropped depth charges and forced the U-boats to submerge deeper and limited their range. U-boats were unable to move as fast as the

convoys from these depths. Of more than 70,000 or so ships in convoy, protected by blimps, only one ship was lost, the tanker *Persephone*. A U-Boat did take out one blimp with its guns. Airships made 37,500 flights and flew 378,000 hours during World War II. In addition, blimps using magnetic anomaly detection equipment were stationed at the Straits of Gibraltar and could readily detect and attack German subs trying to enter in these shallow waters. The PBY bombers had the dayshift and the Blimps had the night shift. Today airships deliver us observations of football games and golf. They are also used to find Kimberlite pipes, geological features where diamonds are usually found.

Contrary to most people's expectations, a dirigible or blimp cannot be brought down by small arms or machine gun fire. Its pressure is slightly above ambient pressure and so helium leaks out very slowly. It can normally leak for several hours and the airship can still return to base.

What are the advantages of dirigible? Dirigibles have extremely high lifting power without using energy (due to buoyancy) and ability to hover. Their disadvantages: they move slowly, can be destroyed in a storm (The U.S. Navy lost its three dirigibles, the *Macon*, the *Shenandoah*, and the *Akron*, in a period of a decade due to severe storms (1925-1935).

Modern Dirigibles

Will the dirigible essentially become extinct? I doubt it. If you have the money, you can buy a NAGY airship for 210 million Euros, which will carry 600 passengers for a range of 7,000 miles. It has 4 floors and travels 200 mph. For 280 million Euros you can buy a 400-ton cargo carrier that can drop 118,000 gallons of water to fight fires, compared to less than 10,000 gallons for a "Super Scooper" aircraft. It can hover above the fire and refill quickly in open water. You could buy a large cargo carrier (1,065 tonnes lift—23.4 million pounds) which can travel 200 mph for a 7,000 mile range. It could take 15.8 million pounds to 10,000 feet altitudes and requires no energy to be added by man to achieve this-158 billion foot-pounds of potential energy. How neat is that! Airships are truly anti-gravity machines! (Airships use the same buoyancy principles developed by fish some 580,000,000 years ago.) What took us so long? This large cargo airship is ideal for carrying oil pipes to oil exploration sites anywhere on earth (at any altitude) and large bridge structures over difficult terrain and place the parts on the bridge that is being built. It will only cost you 360 million Euros. I don't think we have seen the last of the dirigibles.

Gliders (Sailplanes)

While many contributed to the development of gliders over the years, two scientists, in particular, defined the aerodynamics and the proof of concept of the glider that later allowed the Wright brother to invent the airplane. They are Sir George Cayley and Otto Lilienthal.

Sir George Cayley was born to an aristocratic family in England in 1773, the year the hot-air balloon was invented. He was fascinated by engineering projects and developed the tension spoke wheels (bicycle wheels) for weight savings, seat belts, small helicopters with counter rotating blades (at age 23), caterpillar tractors, and a small internal combustion engine in which he burned gunpowder. He also contributed in the field of prosthetics, air engines, electricity, theatre architecture, ballistics, optics, and land reclamation. In the field of aviation, he is credited with being the Father of Aviation. He defined the four aerodynamic forces: lift, drag, thrust, and weight that act upon a flying object. He found that by adding dihedral to the wings, it made the glider more stable (Dihedral is having wing tips higher than the wing attachment points). He studied the lifting power created by increasing the angle of attack and found out, through test, that a wing with a convex upper surface (camber) provided more lift than a flat wing. To investigate drag on objects traveling at various speeds, he built a "whirling arm apparatus, which had been developed for earlier ballistic studies of air resistance. In 1849, he built a triplane (3 wings) that was flown a few meters by a ten-year old boy.

His crowning achievement, however, was the design a large glider for flying across the Brompton Dale. The glider was similar to today's gliders in that it had large dihedral wings (477 square feet), which were uplifted 8-10 degrees from the horizontal, a long fuselage, a tail containing horizontal stabilizers and a vertical fin, and the center of gravity was adjustable by a movable weight. The weight was also below the level of the wings. The wings were made by stretching a fabric over cane frames and wire braced. The entire glider weighed 150 pounds and 150 pounds was left for the pilot. In 1853, as the story goes, he ordered his coachman to fly the glider, pointing out that since he, himself, was 79 years old, he was too old to be a pilot. The glider flew about 600 feet before it crashed. The coachman quit the next day! Note: this flight was 50 years before the successful flight by the Wright brothers.

Otto Lilienthal was born in Germany in 1848 and, because of his experiments and flights, became known as the Glider King. He and his brother Gustav were fascinated by the idea of manned flight. They made strap-on wings but could not fly off the ground. He built an artificial hill 40 feet high and conically shaped from which to fly, realizing, regardless of the wind direction, he always had a potential flight path.

He devised a small engine that worked on a system of tubular boilers and it was safer than existing engines at the time. This invention provided him the money for his gliding experiments.



Photo via Larry Korb

Otto Lilienthal in his Small Biplane glider in Germany, circa 1895.

His glider patent in 1894 in the United States had a bar for carrying and flying the "hang gliders." The A-frame of Lilienthal glider is today's control frame for hang gliders. He made over 2,000 flights witnessed by hundreds of people. He had some flights covering a distance of up to 82 feet, but when he could use the updraft of over 30 feet per second on the hill, he was able to attain distant flights. One day his first flight was 820 feet. The same day, however, on his fourth flight his glider nosed down and he crashed from about 50 feet high. He broke his neck, and despite an operation, lived only 36 more hours, dying in 1896. His gliders were designed to distribute weight as evenly as possible for stable flights. Like modern hang gliders, he could control them by shifting his weight. Unfortunately, his control bar was located at his shoulders and the flights had a tendency to nose down, unlike today's hang gliders whose wings are well above the pilot.

Seven years after Lilienthal's death, the Wright brothers flew the first manned powered glider, which we call an *airplane*. The table was set for the Wright brothers and they, in turn, presented the flight enthusiast with a large and exciting menu. For the next 30 years the airplane took center stage and the glider disappeared from the scene.

Modern Gliders

Starting in 1930, renewed emphasis on the glider appeared, led by development of lighter weight materials, advances in aerodynamics, and advances in instrumentation. This progress is best illustrated by the gain in the glide ratio from 17:1 to 70:1 over the next 80 years. (The glide ratio is the distance traveled horizontally for every foot of altitude lost.) The Boeing 767 has a glide ratio of 12:1, whereas the Space Shuttle has a glide ratio of 4.5:1. Early gliders used wood and cloth, later to be replaced by aluminum, then epoxy- fiberglass, and ultimately, epoxy-carbon composite, greatly lowering their weight. Aerodynamically, the wing was designed for a low-drag laminar flow airfoil and wing surfaces in fiberglass were shaped by molds to high accuracy, and then highly polished. Vertical winglets at the ends of the wings reduce drag and special aerodynamic seals at moving surfaces (rudder, elevators, and ailerons) were designed to stop airflow through the gaps. The more expensive sailplanes are designed to use wing flaps, allowing them to change both the lift and drag, similar to commercial planes when landing. Wings at mid span have zig-zag tape or holes in a line to trip the boundary layer, inducing turbulent flow and preventing the flow of laminar flow bubbles. Wing spans were significantly increased and wing widths were decreased. Some even have wipers to remove bugs from leading-edge surfaces, which interfere with desired airflow. Some even incorporate spoilers that can be used to increase the drag. The fact that the lift/drag ratios can be changed gives another dimension to piloting. Some gliders even have a water ballast tank that is used to minimize the down-force on the vertical stabilizer. (The water is jettisoned before landing.)

In the instrumentation area, the pilots use an altimeter, a compass, and an airspeed indicator. A variometer is also used. It is a device that sends out a sonic pitch that increases when you are increasing altitude and decreases when losing altitude. It is very accurate, detecting changes of about 0.5 inch per second. Thus, it aids in finding thermals. Prior to this, the pilot had to be skilled in reading the lay of the land, recognizing that thermals occur below cumulus clouds as warm air rises and condenses into the clouds. Upward currents occurred at ridges and cliff edges. An electronic variometer, using mathematics devised by Paul MacCready, tells the pilot how fast the pilot should fly between thermals and the amounts of lift or sink when in the cruise mode. This, in addition to computer devices and the GPS gives the glider's position in 3D, alerts pilot of nearby airspace restriction, shows airports within the range of the glider, determines wind speeds and direction at current altitude, provides final glide information and indicates the best speeds to fly under current conditions.



A sailplane set a distance record of 1,900 miles in 2010, a maximum speed of 170 miles per hour and achieved an altitude of 50,720 feet (obviously requiring parachutes and oxygen masks). Sailplanes are typically launched by being towed by airplanes or using high-speed winches with 4,000 feet of towrope. From a high-speed winch, a glider can gain 900 to 3,000 feet altitude. Skids or a single central wheel are used in landing. You can buy a glider for $2,700 to $190,000 from top European suppliers. I think George Cayley and Otto Lilienthal would have loved to see what they created. The table was set for the Wright brothers and they, in turn, presented the flight enthusiast with a large and exciting menu.

About the Author: Larry is very well known to Bulletin readers. He held leadership roles in the Apollo and Space Shuttle programs. He served on several investigating teams, including the Apollo 1 fire and the losses of Space Shuttles Challenger *and* Columbia. *He has provided the Bulletin several astute and scholarly articles reaching back into the past and far into the future. He is an Editor's dream author in his ability to produce a splendid saving article when a deadline disaster is looming in the Editor's face! Bravo Larry!*

The Last Word

by Ed Rusinek



After sixteen years as Editor of the North American Aviation Retirees Bulletin, I get the last word. When you read this editorial, you may ask, "Didn't he ever grow up?" Yes, I did grow up and am pushing ninety, but every so often, I revert back to a nine year-old boy in the 1930s when I used to sneak into the Detroit City Airport through a hole in the fence and wander from hangar to hangar, admiring all the beautiful airplanes, especially the Stinson Reliant, that could achieve speeds of several hundred miles per hour.

Eventually, I would get to the Main Concourse building and mooch baggage stickers from the various bored airline clerks. No one challenged my presence there because, at that time, nine year olds weren't supposed to be wandering around airports alone!

After returning from the service, obtaining my B.S. degree and joining NAA in 1951 at Downey on the Navaho Missile program, we had already flown past Mach 1! AND I never got to work on an airplane!

In 1957, the Russians launched *Sputnik* and the Space Race was on! Although we suffered some stupid disasters early in our Space Program trying to imitate *Sputnik*, we managed to recover through the efforts of Wernher von Braun. We later successfully built and launched an unmanned Apollo Command Module – Spacecraft 9, and went on to assemble the first manned vehicle, Apollo 1.

In conducting ground tests on the pad, NASA insisted that tests be under pressure with pure oxygen. A simple spark caused a blast furnace condition and we lost three Astronauts. Working on the commercial principle that the Customer is always right, several of our best managers had to take the "hemlock cup" and resign!

On the morning of the *Challenger* launch, the temperature had dropped so low that the seals on the two Solid Rocket Boosters were questionable and Morton Thiokol engineers recommended delay until the weather improved. NO! NASA insisted we had to launch because there was a teacher on board and all the school kids were watching! After the explosion seconds into the launch, they would be watching for three more long years before another space shuttle launch took place.

In 2003, we launched our veteran shuttle *Columbia* on her 28th mission. Our engineers noticed that as the vehicle left the pad a chunk of foam insulation broke off from the External Tank and struck the leading edge of the Shuttle's left wing. Our engineers were concerned that this was critical but NASA reasoned that there was nothing that could be done and that suggested delays and repairs were unnecessary. Upon return to the Earth's atmosphere, hot gases entered and destroyed the integrity of the wing, causing the vehicle to break apart. And scattered *Columbia* across two states.

This time, we lost two more years in the completion of the Space Station with the usual assumption of fault and destruction of reputations.

We now ended up with a fantastic Space Station, three very operable Space Shuttles and a strong cadre of highly educated and skilled Astronauts. What do our Diddly-Dos and Diddly-Don'ts in Washington do? They totally erase our Manned Space Program – destroying our three perfectly good shuttles and all supporting launch structure at KSC! We now must beg and pay the Russians $65 million to deliver each of our Astronauts to our own Space Station!

Like the Romans of Caesar's day – to reduce the outcry over their act of total stupidity – they provided the Masses a pompous show. They posted the three remaining flyable Shuttles around the country to show with chest beating pride, "See what we HAD accomplished!" Fifty years from now, people will look at these fantastic machines and wonder what idiot did this, in the same way as we look upon the monoliths at Easter Island and wonder who placed them there and why?

In 1995, I went to Russia to help coordinate the docking of the Shuttle to the Russian Space Station *Mir*. We arrived on a Saturday morning and, after checking in, went to the huge Flea Market located just outside of Moscow. I bumped into two chaps from Collins Radio, our sister division, and found out that they were there to head up an exhibit pavilion at the Moscow International Air Show starting the following Wednesday. After a brief conversation of three compatriots, they invited our group to the air show for the following Saturday providing transportation to Zhukovsky, the once top-secret air base, with the warmest guest hospitality!

We went, and it was a fantastic occasion. The displays were eye openers. From the flight line I watched an ancient airplane, painted olive drab, come in for a landing. It looked like a Douglas DC-3 but yet not a DC-3. Finally, I realized it was a Douglas DC-2. Among the aircraft on display was the Russian Shuttle – the *Buran*. It was an exact copy of our Shuttle with two jet engines added to fly as an airplane. In fact, it was flown in for the air show.

Lastly, among the variety of exhibits, stood an immaculate and shiny Yakovlev Yak-3, a Russian fighter of World War II fame. I entered the pavilion and was greeted by the Yakovlev representative – a grey haired man in his late fifties, neatly dressed in a blue jacket, gray slacks, white shirt and a matching tie – I asked if the plane outside had been so beautifully restored from an existing WWII aircraft. He smiled and said, *"No! American millionaires have discovered the Yak-3 and already ordered 22 of them, sans the engines. So we have dug up the old tooling and molds and have started a new small production line."* It was obvious the Russians do not destroy or throw anything away that they build, except, perhaps, THEIR STUPID POLITICIANS!

The man was so full of himself that I decided to frost his tongue. I said, *"You don't speak English like a Russian and you obviously aren't American. Who are you?"* He was somewhat befuddled and slowly said, *"I am English. I came to Russia many years ago and decided to stay."*

It was obvious that he was a Russian "Spook." I had enough of this charade and I told him, *"I think you were a spy for the Russians. You escaped from Britain and you can't go back because they will hang you!"* With that, I left him standing with his mouth agape!

In closing, we have witnessed the destruction of America's Manned Space Program in the elimination of our flying machines and the launch sites we used to launch and recover them! However, there is one more concern that I wish to bring up. The NASA has assembled the greatest group of highly trained, dedicated, intelligent and courageous Americans in our American Astronaut Corps. What are we going to do about utilizing this wonderful resource? Well, Golly Gee! Nobody said anything about them! Can't the Russians take care of them? Yes! They can deliver one American Astronaut to the Station every four months but what do the rest of them do in the meantime?

Here is a thought. We currently have no means of delivering them to the Space Station. However, we do have work going on creating new vehicles that can. In the meantime, can't we convert NASA's Johnson Space Center in Houston into a National Science Center capable of investigating and resolving the many diseases, disasters and major issues confronting our Nation today? To be led by these Astronauts, supported by the brightest engineers, scientists, doctors in the Nation and constantly to be invigorated by the very best young people coming out of our schools.

This is Ed Rusinek with The Last Word!

Congratulations and Best Wishes to

James and Geraldine Haywood of Bluffton, South Carolina celebrating their 72nd Wedding Anniversary

David and Ellen Herold of San Marcos, California celebrating their 69th Wedding Anniversary

Roderick and Rita Bang of Newberg, Oregon celebrating their 61st Wedding Anniversary

A COMPLETE HISTORY OF U.S. COMBAT AIRCRAFT

Fly-Off Competitions
by Erik Simonsen



Foreword by former USAF historian Dr. Richard Hallian.

Fly-Off contains ten chapters of well-known fighter/bomber competitions, and explains in detail how fly-off competitions are conducted, it shows the reader what both competing aircraft designs looked like during their trials, and then what the losing aircraft would have looked like in operational markings had it actually won. Author Erik Simonsen uses the wonders of modern digital photography to create highly believable images of aviation's most tantalizing "might have beens."

Hardcover, 228 pages
Order at Specialtypress.com or Amazon.com.

Contrails from the Past

by Ed Rusinek

Dear Ed,

I normally don't write letters, but I could not pass up the chance to add to the Jim Pearce "leg" tales.

I worked with Jim at the Cape on the Apollo Program and, one night, we went sailboat bracing off the Cape. We heard a flying fish come on board with a great commotion, then everything got very quiet. When we finally located a flashlight, we found that a flying fish had pushed its head into Jim's artificial leg! A real "hole in one!"

Jim was a great gentleman and good friend and always fun to be with at work or play.

Thanks!

— Dave Dysart, Bow, WA

Ed's Resp.: When I started "Contrails" so many years ago, I never realized the many short, short stories it would generate. Thank you, Dave, for a great story, although a bit "fishy."

Dear Ed,

I am enclosing a clipping which indicates that the late Gary Gabelich, the last American land speed record holder, has been inducted into the Motorsports Hall of Fame.

I met Gary when I was a volunteer for tests conducted at the Space Station Rotational Test Facility in Downey. He was a test engineer on the program. When it ended in 1969, he returned to speed racing. In 1970, he drove *Blue Flame*, a 37-foot long rocket-powered car fueled by liquefied natural gas and hydrogen peroxide at the Bonneville Salt Flats. He established the land speed records in the flying mile of 622.407 mph and the flying kilometer of 1,014.52 kmph.

For my voluntary participation in the rotational tests, I received a certificate indicating I had completed a "mission" in the rotating vehicle and had undergone the "rigors of vestibular, oculogyral and proprioceptor stimulation, with some loss of gastro-intestinal equilibrium."

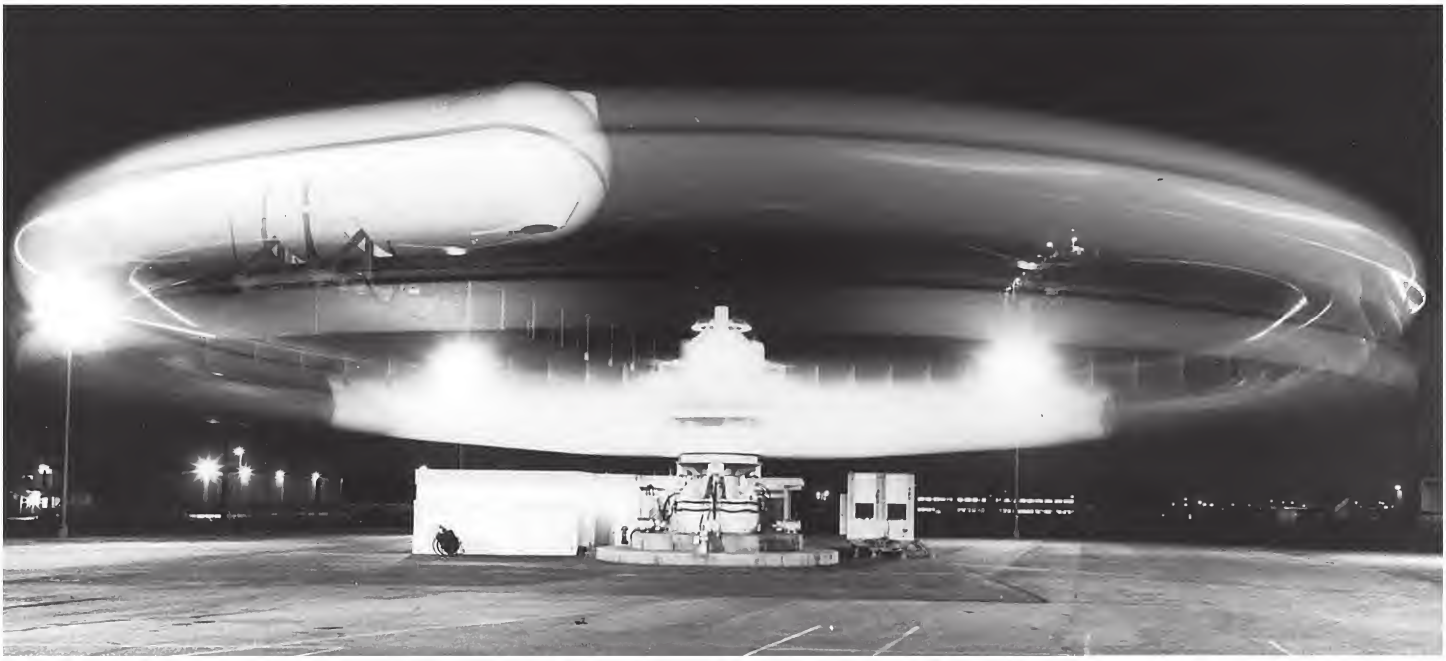
— William Hotarek, Ellensburg, WA

Ed's Resp.: Thank you, Bill, for your brief report on Gary's participation in the Space Station Rotational Tests. However, does the matter of you losing your gastro-intestinal equilibrium a nice way of saying you puked all over the test console?



Ed Rusinek collection

Volunteer participants and staff members of the Artificial Gravity Simulation Program, including Dr. James Green, Program Manager, and R.E. Greer, Vice President, Space Station Program during presentation of Certificates of Appreciation to the volunteers. Bill Hotarek is fifth from the right, front row.



Ed Rusinek collection

The Space Station Rotational Test Facility during operation appears to be almost tubular while in motion. Note the size of the fire extinguisher cart standing beside the building.

Apollo/Shuttle Engineering Luncheon



This month's Apollo/Shuttle Engineering Luncheon was held on July 20, 2016 with some new faces present. Standing in back: Pete Magoski, Ed Smith, Susan Smith, Jim Johnson, Ken Muzzy, Ralph Gatto, Chris Rogers, Chuck Lowry, Bruce Brandt, Wil Swan, Frances Farris, and Bob Kelly. Front row seated: Jerry Shamblin, Frank De Barro, Dave White, Jim Rowe, Larry Korb, Lloyd Mustin, Tak Shimamoto, Walt Rivera, and Diana Kelly.

This informal chance to break bread together is held on the 3rd Wednesday of the Month at the Hometown Buffet, 1008 E. 17th Street, Santa Ana, California at 11:30 A.M.

For more information, contact Jim Rowe at (714) 637-3020.

"For my confirmation, I didn't get a watch and my first pair of long pants, like most Lutheran boys. I got a telescope. My mother thought it would make the best gift."

— Wernher von Braun

The Silent Majority

by Stan Guzy

ACKER, OTTO G., 99 – of Columbus, OH passed away on August 13, 2016. He received his Aeronautical Engineering degree from Tri-State College in Angola, Indiana and started his career at Curtiss-Wright. He joined NAA at the Columbus Division. His assignments involved more than 40 airplane designs and working closely with the U.S. Navy included time on the aircraft carrier, USS *Independence*. He retired in 1977 with 26 years of service.

CICCHESE, JAMES J. 91 – of Agora Hills, CA passed away on July 29, 2016. Jim joined LAD in Materials in the late 1940s and retired in 1986 as Purchasing Manager of Major Subcontracts.

DEIGHT, LAWRENCE "LARRY", 92 – passed away peacefully on July 21, 2016. He came to California in 1953 and joined the B-1 effort after earning a B.S. in engineering degree at USC. After retiring, he received several commendations for his volunteer work, especially with the Huntington Beach Police Department.

GUERTIN, LESTER J., 82 – passed away in his daughter's home in Oakland, CA on July 28, 2016. Earning a degree in Chemistry from Loyola University, Les began his career at Sunkist before transferring to NAA. He worked Apollo and Space Shuttle programs. He is fondly remembered as a gentle and generous person.

MORGAN, WALLACE, 98 – of Fullerton, CA passed away on December 2015. Wallace retired from Space Division in 1987 with 27 years of service in the L&T Laboratories. He is survived by his loving wife of 46 years, Lorraine. She was also an NAA employee when they met and fell in love.

NICKEL, WALTER R., 89 – passed away on June 30, 2016. Walter came to California in 1953 and served in the Aerospace, Autonetics and Microelectronics divisions of NAA. Walt retired in 1986 and started his own engineering consulting firm. He will be remembered for his caring and gentle nature and his dedication to his family.

PRESCOTT, PHIL J. – the Bulletin received news that Phil Prescott of Los Altos, CA passed away on February 6, 2016. Phil retired in 1975 with 33 years of service at LAD and 2 at Space Division.

SARTAIN, JAMES, 84 – of Los Alamitos, CA passed away on August 16, 2016. After serving in the Army, Jim earned his B.S. degree from CSULB and an M.B.A. from USC. He retired from Autonetics in 1993 with 30 years of service and became a very active member of his church, St. Hedwig, in Los Alamitos, CA.

SPINNEY, VAN W., 78 – died on August 13, 2016. After serving in the Air Force, Van earned a B.S. degree from Northrop University and a M.B.S. in Engineering from CSU Fullerton in 1971. He retired from NAA with 28 years of service.

SQUIRES, RONALD A., 88 – of Yorba Linda, CA passed away on November 16, 2015. After serving in the Army, he earned advanced degrees from USC. Ronald retired in 1985 with 30 years of service and decided to return to his family homestead with his wife, Shirley. They returned to Yorba Linda, CA in 2000.

WOJTON, HENRY P., 94 – a true patriot, Henry passed away on June 1, 2016 in Titusville, FL. He served during WWII in the USAAF as a mechanic/crew chief. He joined NAA at the Columbus Division and was assigned to flight test at Eglin AFB. He reenlisted during the Korean War and, again, served as a mechanic/crew chief on the F-86. Returning to NAA at KSC, he served on the Apollo, Apollo-Soyuz, Skylab and Space Shuttle programs. He retired in 1983 with 31 years of service. Henry is survived by his loving wife of 55 years, Helene.

LOST SHEEP, BULLETIN RETURNED WITH NO FORWARDING ADDRESS

RICHARD HANSEN – SAN CLEMENTE, CA

PHILIP J. HODGETTS – WESTMINSTER, CA

BILLIE JO SCHELL – COCOA BEACH, FL

CARL R. SCHEUPLEIN – COCOA BEACH, FL

JOHN M. YOSAN – LA PALMA, CA

"We do not remember days, we remember moments."

— Cesare Pavese

NORTH AMERICAN AVIATION
RETIREES BULLETIN
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North American Aviation Retirees Bulletin
"Where The Best Never Rest"

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Photo courtesy of Dr. Rhea Seddon

NASA Astronaut Dr. Rhea Seddon effortlessly lifts fellow Astronaut (and husband) Robert "Hoot" Gibson overhead while training in the KC-135 weightless environment simulator commonly referred to as the* "Vomit Comet." *Dr. Seddon was one of six women selected to become America's first women astronauts in 1978 as members of NASA's Astronaut Group 8.

NORTH AMERICAN AVIATION
Retirees Bulletin
"Where The Best Never Rest"

Winter 2016

Inside:

NAA TRAINERS, ALL WINNERS by Mark Frankel and Tommy Thomason

THE THANKSGIVING DAY ATTACK ON FORMOSA by Lt. Col. Reagan Schaupp

THE LAST FLIGHT OF ELWYN G. RIGHETTI by Jay Stout

MY FIRST COMBAT MISSION by Capt. Ron Lissner

A P-51 MUSTANG SHOT DOWN A C-47 by Col. Kenneth Tollefson

DEAR READERS OF THE NAA RETIREES BULLETIN by Michel Juif



"A Big Victory" *printed with permission of the Artist*

***The largest aircraft to participate in combat during World War II, the Blohm & Voss BV 238 flying boat was powered by six Daimler-Benz V12 piston engines and featured a wingspan of nearly 200 feet. Moored at Schaalsee Lake in Germany, the enormous aircraft was spotted by Major Urban "Ben" Drew, while flying his P-51 Mustang,* "Detroit Miss" *along with two other pilots from the 375th Fighter Squadron, at which time they attacked and destroyed the aircraft. Prolific aviation artist Stan Stokes captures the initial moment of the attack in his striking painting,* "A Big Victory."**

NORTH AMERICAN AVIATION
Retirees Bulletin

North American Aviation Retirees Bulletin, an affiliate of the Bald Eagles, Inc., is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAA Retirees Bulletin can be contacted at The Boeing Company, Seal Beach facility by phone at (562) 797-3836. Send mail to:

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Dear NAA Retirees Bulletin Subscriber

And so here we are at the end of our 16-year journey trying to keep the name of our beloved Company alive! Looking back to that Fall day in 2000 when we were informed that Boeing had withdrawn any further support of the Bulletin, it was a very bleak day indeed! We were offered office space at the Seal Beach facility and a phone line but no access to further printing, addressing and mailing out of Boeing. Four others and I decided we were North American Aviation people and North American Aviation people never give up! We managed to scrape together a few dollars and send out a "Hail Mary" issue to the 9,600 retirees who had received a free copy from the Company. We got back 3,600 responses with subscription checks and a $500.00 donation from a retiree in Las Vegas. With that vote of confidence, we managed to do the impossible! We expanded the Bulletin from a measly eight pages to twenty pages. To relate to young people looking to the future in the Sky, we established four awards to be presented yearly into perpetuity at the USAF Academy to the best graduates in Aeronautics (2), Astronautics and the Prep School. When we learned that no technical speakers ever came from Industry, we sent them technical speakers to the campus. To further leave our footprints in history, we installed three black granite memorial benches in prominent aviation sites to be seen by future generations. But even now, with so many of us gone to the other world, we are not ready to just call it quits!

We have unfurled our colors, sharpened our sights and are preparing to charge into the future with one more project in January 2017. Right now we are almost complete with a DVD disc that will contain every Bulletin we have published in these sixteen years: page-by-page, issue-by-issue, year-by-year! It will contain a Table of Contents, listing each issue and the articles contained in each one with the names of the authors/artists. It should be a fantastic history of our great company. Copies will be sent to each current NAA subscriber and supporter. Copies will be also sent to Aviation/Military libraries and Aviation Historians.

Finally, we have three more sites interested in having our black granite benches so more to come on that project. As you can see, we are not ready to call it quits! We are the Best and we never Rest! After the first of the year our Phone Number will remain (562) 797-3836, our E-Mail Address will be: *KENISURE@SOCAL.RR.COM*. We shall retain our Mail Box so our address will remain:

NORTH AMERICAN AVIATION RETIREES BULLETIN
P. O. BOX 3797
SEAL BEACH, CA 90740

Whatever your relationship is to your God, may we take this moment to wish you and yours good health and that you and yours always stand in the light of your God's Blessings!

NAA Trainers, All Winners

by Mark A. Frankel and Tommy Thomason,
exerpted from "Training the Right Stuff" *published by Schiffer Publishing, Ltd.*

The First NAA Aircraft

North American Aviation, the preeminent manufacturer of tactical military aircraft, was equally dominant in the field of military training aircraft. NAA's first airplane, Model NA-16, was a trainer that evolved into the most successful trainers series in history, the AT-6 and SNJ.

In the mid-1930s, Dutch Kindelberger, North American's founding president and general manager, saw military training aircraft as a perfect opportunity for his new company His first North American design, the NA-16 was a departure from typical biplane trainers of the day. It was a two-place, open cockpit, cantilevered, low wing monoplane, featuring an all-metal structure (only the fuselage and control surfaces were fabric covered). It was successfully test flown by Eddie Allen on April 1, 1935 and within a month was demonstrated to the Army Air Corps Material Command at Wright Field. It generated an order for 42 aircraft but the Air Corps required several production changes including a sliding canopy, landing gear fairings, and a 400 hp Wright Whirlwind R-975-7 engine. The Army accepted Kindelberger's design as Basic Trainer type 9 or BT-9. The Navy followed with an order for 40 examples powered by a Pratt & Whitney 500 hp R-1340 engine (Naval designation NJ-1). Kindelberger's strategy was paying off handsomely.

Further enhancements to the BT-9 resulted in a model with an improved engine, new outer wing panels, a new tail, and a metal skinned fuselage. Now designated BT-14, the Air Corps placed an order for 251 units, one of the largest trainer procurements at that time. But before the first BT-14 flew, Kindelberger's team was already at work on a variant with retractable landing gear and guns giving it limited combat capability. It was presented to the Air Corps as a new class of aircraft, the Basic Combat type (BC) and the Air Corps ordered a prototype that flew on February 11, 1938. After a successful flight test program the Army ordered 180 retractable gear trainers as the BC-1 and the Navy ordered 16 examples as the SNJ-1. Ultimately the Air Corps abandoned the Basic Combat concept and reclassified the aircraft as Advanced Trainers with the designation AT-6. Gradually the features of the Army AT-6 and the Navy SNJ became standardized and by the spring of 1941 the aircraft were nearly interchangeable.



NARA

BT-14 was a further improvement of the BT-9. The Army ordered 251 units, the largest trainer order at that time.



Gerald Baltzer collection via Mark Nankivil

Model NA-16 during the Air Corps Trainer competition at Wright Field, 1935.



NARA

BC-1 was developed as a basic trainer (BT) but was designated basic combat (BC) for procurement reasons.



NARA

Model NA-16 evolved into model NA-19 as a result of the production changes required by the Air Corps. The Army version was designated BT-9, the Navy NJ-1.



NARA

The Army AT-6 and Navy SNJ were direct descendants of the BC-1.

As World War II loomed orders for North American's trainers strained the production line at Inglewood forcing Kindelberger to open a second production line in Dallas, Texas. On April 10, 1941, Air Corps contract W535 AC-19192 placed an order for 2,970 AT-6Cs and 2,400 SNJ-4s to be built at the new Dallas plant. Early in the war the Navy retrofitted tailhooks onto 20 SNJ-3s for carrier training designating them SNJ-3Cs. The SNJ proved highly effective in teaching carrier landings. 75 SNJ-4s and 50 SNJ-5s received tailhooks also making them -4Cs and -5Cs (two -7s, the final SNJ model, received tailhooks making them SNJ-7Cs).

The end of hostilities left the Army and Navy with a huge inventory of trainers. Both services experimented with the most efficient means of training post War students and both decided to retire their low powered, fabric covered, Stearman biplanes and use AT-6 and SNJs for primary and basic training.

Post-War Trainers

In September 1945, the Navy realized the need to modernize its aging training fleet. NAA was now regarded the dominant source for trainers, so a contract was awarded for the replacement of the well-worn SNJ. Two flying prototypes and a static test article designated XSN2J-1were ordered.

The XSN2J-1 was larger and heavier, intended to be much more capable in the training role than its predecessor, the SNJ. It was equipped with dive brakes on the upper surface of the wing and could drop bombs and fire rockets. There were also provisions for two .50 caliber machine guns, one in each wing, and a Mk 8 gunsight. As a result it required a more powerful engine than the SNJ's 600 hp Pratt & Whitney R-1340. The 1,100 hp Wright R-1820 Cyclone was chosen and a tailhook structure was carefully designed for the new trainer, unlike the tailhook that was just scabbed on as an afterthought to the SNJ. It was also designed to be catapulted if desired, a feature that the SNJ did not have. Another innovative feature for instrument flight instruction was that the instructor in the rear seat was to have the ability to "upset" instruments in the student's cockpit to simulate emergencies. The new trainer's first flight was accomplished on 10 February 1947 by North American test pilot George Welch.

Unfortunately, in 1948, the SN2J-1 didn't provide enough of a training benefit in light of the budget reductions imposed by the Truman administration. Replacing propeller-driven tactical aircraft with jets was a much higher priority than replacing trainers that were considered adequate to the task. The SNJ continued to suffice in the Navy for the time being, which turned out to be several years. Nevertheless, the XSN2J-1 program, while soon forgotten, would be the genesis for the first new primary/basic trainer to be utilized by the Air Force and Navy training commands in more than a decade.

T-28A

In 1947, the U.S. Army Air Forces became a separate branch of the service and the newly formed U.S. Air Force released preliminary requirements for a new basic trainer. The Air Force emphasized maintenance access, and a tricycle landing gear configuration that dictated a new design competition. The nose-wheel arrangement provided better directional control on the takeoff and landing roll. In 1948, the Air Force issued a request for proposals for its new trainer. In the process, it simplified its designation practice for trainers, eliminating the use of P for Primary, B for Basic, and A for Advanced as a prefix. The numbering for new trainers was to begin with 28 since the highest number reached in the P/B/A series was the PT-27. (The AT-6 was now the T-6.) Fourteen companies submitted a total of 28 designs. The two finalists in the competition were North American and Douglas. Their winning proposals were designated XT-28 and XT-30 respectively. Both were powered by the 800-horsepower Wright R-1300 radial engine. In its proposal for the XT-28, North American placed particular emphasis on maintainability in addition to meeting all the other specific requirements. Easily opened doors were provided for access to system components. The engine accessory components mounted on the rear of the engine were accessed through the nose wheel well and an access door in the firewall that was reached with an integral ladder. The engine cowling was quick opening and self-supporting.

The XT-30 was an unusual configuration. Douglas engineers were driven in part by the Air Force requirement for good over-the-nose visibility and also, reportedly, the ease of replacing the



NARA

At the end of WWII, an enormous number of Stearman PT/N2S and North American AT-6/SNJ trainers remained in the inventory. Though they were both designed in the 1930s, the Army and Navy training commands continued using them.

reciprocating engine with a jet engine in the future. Its Wright R-1300 was therefore located behind the rear cockpit with an extension shaft driving the nose-mounted propeller and a cooling fan drawing air in from a nose-mounted inlet. Douglas claimed that there was no maintenance penalty associated with the submerged engine arrangement. There were, however, few examples of airplanes with engines buried in the fuselage and even fewer had been carried forward into production.

The Air Force evaluation favored the North American proposal for its maintainability features but expressed some concern about the airplane's rollout directional stability and turnover angle. A nose-wheel configured airplane with a radial engine was forced to be relatively short coupled because of center-of-gravity considerations. This reduced directional stability during rollout, particularly in crosswinds. Raising the cockpit to provide the requisite visibility over the nose resulted in a relatively high center of gravity. If a student pilot lost control on roll out and ran off the runway or landed hard on the nose wheel, the nose landing gear could fail. The result might be the airplane flipping over onto its back, a much more dire outcome than the usual result of a bad landing in the ground-loop-prone T-6/SNJ. Since this was to serve as a primary trainer that student pilots with little experience were expected to solo, both scenarios were distinct possibilities.

The Air Force awarded North American a contract in May 1948 for T-28 prototypes. The first XT-28, 48-1371, flew on 24 September 1949 at the Los Angeles International Airport, piloted by NAA test pilot Jean "Skip" Ziegler. An order for 266 T-28As followed with the popular name of Trojan. But development problems slowed production of the T-28A so an upgrade to the T-6 fleet was initiated in 1949. Selected Texans were refurbished to the T-6G configuration. The airframes were completely stripped down and cleaned, the engines and propellers overhauled, and the avionics upgraded.

When the T-28A finally entered service, the steerable nose wheel configuration significantly improved the visibility forward when taxiing. The over-the-nose visibility requirement in flight was provided by a high seating position under a large canopy. The canopy segments over the front and rear seats were opened by hydraulic power. The canopy sill was relatively low; with the canopies open, much of the pilot's torso was exposed, an advantage for entry/exit and more importantly, for bailout. (During taxi with the canopy open, it has been likened to riding an elephant.)



NARA

The North American XT-28A during flight test at Edwards Air Force Base, California.

The T-28's wings attached to the fuselage with eight degrees of dihedral, a notably large amount, which insured excellent lateral stability. There were significant features related to initial cost and maintainability. For example, the outer wing panels could be removed without disconnecting the aileron cable system. The horizontal stabilizers were identical. Two men could remove a horizontal stabilizer or the vertical fin in ten minutes. The left and right elevators and trim tabs were also interchangeable. The T-28A had a gross weight of 7,800 lb, 2,600 more than the T-6 it replaced. Its engine provided 800 hp. an increase of 200 hp. over the T-6. Although the power to weight remained about the same as the T-6, T-28A performance was noted for being anemic, particularly on takeoff.

The two XT-28As were equipped with speed brakes but these were deleted for production.

The rollover pylon (turnover truss by North American engineers) that had been incorporated to guard against potential turnovers proved unnecessary and was deleted. As a result, after evaluation on 49-1709, the canopy was lowered four inches effective with 51-3763. The windscreen angle was increased by 2.5 degrees. These changes improved the instructor's visibility forward and were a slight benefit to speed and range.

The first production T-28As were delivered in April 1950. Production totaled 1,194 airplanes although not all were delivered to the U.S. Air Force. Together with the T-6G, they provided all the Air Force flight training prior to the students' transition to the T-33 jet trainer. In November 1952, however, initial screening of student-pilot candidates once again began to be accomplished with civilian contractors in light civil airplanes like the Piper Cub. This provided an early and relatively inexpensive means of weeding out those with a fear of flight, airsickness, or poor coordination.

The T-28A had a short career as a trainer with the Air Force. In 1957, after experimenting with an all-jet syllabus, the Air Force decided to eliminate propeller trainers. The last T-28A departed the training command unit at Bainbridge Air Base, Georgia in January 1958. These were relatively new airplanes (the last production T-28A for the Air Force had been delivered in 1953) so many soldiered in other roles for proficiency and utility flying.

T-28B

Seven years had passed since the Navy evaluated the XSN2J-1 and failed to order it into production. By 1952 the Navy's need to replace its aging SNJ fleet had become acute. To expedite the procurement decision the Navy evaluated two Air Force T-28As as advanced instrument trainers assigning Bureau Numbers 137636 and 137637 with the designation T-28B. The Navy specified a more powerful engine for the evaluation, so North American installed a Wright R-1820 in a larger cowling with a 3 bladed propeller to absorb the additional 625 hp. North American test pilot Robert "Bob" Hoover made the first flight of the prototype T-28B, modified from 137636, on 6 April 1953.

Whereas the T-28A trundled aloft on 800 hp, the "B" leaped into the air behind 1,425 hp. Although the "B" had a 20% higher gross weight, 8,095 lb, it was more than offset by a 78% increase in horsepower, resulting in a weight-to-horsepower ratio



Tailhook Association via CDR Doug Siegfried

Legendary North American Aviation test pilot Bob Hoover stands by the Navy's first T-28B.

of 5.8. The engine was mounted with a down-thrust angle of five degrees—twice that of the T-28A, because of the higher thrust of the big Wright driving a three-bladed propeller. The service ceiling increased by about 50%, a significant improvement provided in large part by the single-stage supercharger of the R-1820. This was a mixed blessing because the pilot was required to manually shift the blower speed at about 10,000 feet (the critical altitude) to increase power available at higher altitudes. This was accomplished like shifting the manual transmission in an automobile, by first reducing the power with the throttle, changing to the higher blower setting, and then pushing the throttle back up. Mismanagement of the shift risked over boosting the engine, which shortened its life, as did forgetting to change back to the lower blower setting when descending through the critical altitude and then adding power. The deleted T-28A speed brake installation was reinstated on the T-28B. Although unnecessary in a propeller-driven airplane that had a built-in speed brake – the propeller, it served to familiarize the student with the function of the speed brake that was a necessary feature on jet airplanes. It came with a flight-manual caution, however, because it caused a nose-up pitching moment when deployed that increased with speed. It was therefore not to be extended above 250 knots indicated airspeed. There were other minor changes from the T-28A such as a castering nose wheel and relocation of the battery to help offset the heavier engine.

The first production T-28Bs were delivered to Navy Advanced instrument squadrons beginning in 1954. The 489 production T-28Bs also replaced the SNJ for all Basic training except for carrier qualification, which remained the province of the SNJ-5Cs. Most T-28Bs were built in Downey, California, with the last 49 or so produced in Columbus, Ohio. At one point, there were eleven Navy training squadrons operating T-28Bs, nine in the Pensacola, Florida, area and another two at Meridian, Mississippi. The T-28Bs served far longer in the Navy training command than the T-28As did with the Air Force. Captain William B. Nevius, USN (Ret.) was a flight instructor in T-28Bs with ATU-803 in 1955 when his daughter Colleen was born. The day he brought his wife and daughter home from the hospital, he had been flying BuNo 137648. Colleen attended Purdue University on the Naval ROTC program, which had just been opened up to women. Upon graduation in 1977, she was accepted for Naval Aviation training, which had just been made available to women. She soloed in 1978 in the same T-28 that her father had flown 23 years earlier.

VT-27, based at NAS Corpus Christi, Texas, was the last squadron to provide training in the T-28B. The final T-28B training sortie occurred in early 1984. BuNo. 137796, the Training Command's last T-28B, was ferried to the Naval Support Facility at Anacostia, Virginia on March 14, 1984 for static display.

T-28C

The T-28C was developed to replace an aging fleet of carrier-capable SNJs that had been subjected to the wear and tear of high-sink-rate touchdowns and high stress loads in the aft fuselage from arrested landings. The first T-28C, model NA-252, was modified from a T-28B for a first flight on 19 September 1955. (In this case, the "C" no longer stood for carrier-compatibility but was simply the next revision letter alphabetically.) The lower aft fuselage and rudder were notched to accommodate a tail hook, the landing gear modified for greater oleo stroke to absorb even harder touchdowns, and the propeller shortened to provide an additional five inches of ground clearance to avoid the pecking the deck after a tailhook engagement. (The blades were slightly wider to maintain the solidity.) The changes resulted in a gross weight increase of about 250 lb, which slightly reduced speed, rate of climb, service ceiling and range, but not by enough to compromise its training effectiveness.

The Naval Air Test Center (NATC) accomplished at-sea carrier suitability testing of a T-28B, BuNo 138187, modified to the carrier configuration in November 1955 aboard the *Essex*-class aircraft carrier USS *Tarawa*. LCDR W.F. Tobin and LT Robert R. King accomplished 50 landings during the at-sea evaluation that had been preceded by the usual and extensive shore-based testing. Introduction of the T-28C for actual carrier qualifications was delayed until April 1957 when an *Essex*-class carrier with an angle-deck, USS *Antietam* (CVS-36), became



Tailhook Association via CDR Doug Siegfried

The T-28C was a carrier-capable trainer which replaced the aging SNJs that were used until the mid-1950s.

available to replace the smaller, more challenging, straight-deck CVL. At that point, the days of the 1935 vintage SNJ were numbered. The last SNJ training flight was completed on 21 May 1958 and the last SNJ was retired from the Navy in February 1960.

North American produced 299 T-28Cs at the Columbus plant between 1955 and 1957. It was operated by four training squadrons in the Pensacola, Florida area: VT-2, 3, and 6 at NAS Whiting Field and VT-5 at Saufley Field.

Early Jet Carrier Trainers

In the early 1950s, the Navy began looking for a carrier capable jet trainer to supplement its fleet of land based Lockheed TV-2s (later designated T-33B) jet trainers. Carrier training prior to the advent of jets was relatively straightforward with low-performance propeller-driven trainers like the SNJ and T-28 that were readily adapted to carrier approaches and arrested landings. But a jet fighter's approach speed and low-speed handling qualities, while acceptable for an experienced naval aviator, were likely to represent a challenge to a low-time pilot making his first landing in a jet after qualifying aboard with two touch and goes and four arrested landings in a T-28. What was needed was a jet that did not approach quite as fast as a fighter and was relatively easy to fly at low speed.

In 1953, Lockheed self-funded a carrier-capable modification of the TV-2/T-33. Named Model L-245, it featured redesigned engine inlets, wing, empennage, rear cockpit, and canopy, and a tailhook. Most of the modifications were focused on low-speed performance and handling qualities. Aerodynamically actuated slats were added to the wing leading edge and a boundary layer control (BLC) system was incorporated to improve the effectiveness of the trailing edge flaps. BLC used high-pressure bleed air from the engine compressor to delay separation of the airflow over the wing flaps to higher angle of attacks. (Lockheed originally expected to reduce takeoff stall speed by 10 knots and landing stall speed by eight knots.)

The Navy liked Lockheed's carrier-capable jet trainer and ordered eight as the T2V-1 Seastar in May 1954. But shore-based carrier suitability testing in 1956 revealed problems with the effectiveness of the boundary layer control system, tailhook bounce tendencies, directional problems during arrested run out, and landing-gear rebound on touchdown. The T2V-1 was modified to resolve these issues and it entered squadron service in early 1958, but recurrent problems with the boundary layer control system and difficulty with slow speed handling limited the Seastar's effectiveness in carrier operations.

In the meantime, Grumman proposed a two-seat variant of its swept wing Cougar, the F9F-8T. The first example was converted from a production single-place F9F-8, BuNo 141667, and flew on April 4, 1956. Grumman's changes to the single seat Cougar consisted of extending the forward fuselage by about 34 inches to accommodate a second complete cockpit and relocation of equipment to maintain the proper center of gravity.

Tests revealed that vision from the aft cockpit was unsatisfactory for at-sea carrier approaches and landings; however, it was deemed adequate for demonstration of shore-based approaches and monitoring the student's field-carrier-landing practice. Since the student's at-sea qualification was accomplished solo after many hours of dual and solo field-carrier landings, this limitation was acceptable. Grumman delivered the first production F9F-8T of an initial 155-airplane order in July 1956. Service Acceptance Trials began in March 1957 and concluded in July. Deliveries to ATU-223 at Chase Field in Beeville, Texas began in late 1957 although fleet units had begun receiving F9F-8Ts as early as March for proficiency training.

T2J-1

Although Lockheed and Grumman were developing jet trainers based on existing airplanes, the Navy also decided to pursue a clean sheet of paper approach to its basic trainer requirement. The Bureau of Aeronautics issued an RFP (Request for Proposal) on 2 December 1956 against its Outline Specification 141 for a jet basic trainer. Seven proposals were received on 30 January 1956. The specification required the capability to operate to and from an aircraft carrier like the T-28C but with the benefit of a catapult launch. The airplane was to be easy to fly visually or on instruments. It had to have provisions for limited weapons training, both guns and rockets/bombs, including an APG-30A Ranging Radar installation for a gun sight. In-flight refueling, a requirement for jets that was just being introduced in the fleet, was the only notable omission of an operational capability. Like the Air Force's T-28 program, reliability and maintainability received equal emphasis with performance. The gross weight was expected to be 10,500 lbs or less.

The new trainer was to have a stall speed of not more than 65 knots (with 20% of internal fuel) and a maximum speed of at least 400 knots (at 25,000 feet and military thrust). The maximum takeoff and landing distances over a 50-ft obstacle were to be 3,000 feet and 3,500 feet respectively. A service ceiling of at least 35,000 feet was required. Two missions were defined, at least 1.5 hours of endurance (internal fuel) and 700 nm range (with external fuel if required). Speed brakes were required to decelerate from V_{max} (level flight, military thrust) to 0.8 V_{max} in level flight in not more than 16 seconds.

Two acceptable engines were listed, the Westinghouse J34-WE-46 and the Allison J33-A-24. All but one of the proposals were powered by the J34; it provided less thrust than the J33 but had a better thrust-to-weight ratio and used less fuel for the defined missions so the resulting design had lower empty and gross weights.

North American had promoted a "Jet T-28" that resembled the propeller-driven T-28. Its wing (with substantially less dihedral), landing gear, and windscreen were similar if not identical, but the rest of the airframe was new. The substitution of the J34 jet engine in the aft fuselage for a heavy radial engine in the nose required a substantial shift in the position of the fuselage on the wing, with the cockpit positioned well forward; the empennage moved closer to the wing and was enlarged to provide adequate control power.

One of the Navy's objections to the Jet T-28 was its relatively low critical Mach number. At least in part as a result, North American submitted an all-new design in response to the Request for Proposal (RFP). Virtually all that remained of the T-28 configuration according to the proposal were "the same conservative design principles." The wing planform was similar but in order to raise the critical Mach number, it was reduced to a 12% thick section and aileron boost was incorporated.

North American's second proposal became the winning entry, and was designated T2J-1. The development risk was low. The engine, always a critical success factor particularly in



Tailhook Association via CDR Doug Siegfried

A T2J-1 in approach configuration for an arrested landing on an aircraft carrier.

a single-engine application, was a Westinghouse J34 first run in January 1947 was rated at 3,400 lb of thrust. Although differing in detail, the unswept, non-folding wing was arguably a direct descendent of the one on North American's first jet fighter (and one of the Navy's first carrier-capable jets) the FJ-1 Fury. The control system was based on the T-28 with hydraulic boost added. Reliability, durability, and ease of maintenance were emphasized as the Navy had desired. For example, almost all replaceable items were located at waist level or below for ease of access. A higher rear-seat position and ground-level ejection capability at speeds over 75 knots (with a North American-designed seat) were other proposal features.

The Navy ordered six preproduction airplanes with the June 1956 contract rather than the usual one or two prototypes. A second contract for 121 production aircraft was received at the end of 1956, well before the first flight, which was accomplished on 31 January 1958 by Richard Wenzell at Columbus, Ohio. Development was relatively trouble free, although the North American test pilots considered the T2J to be underpowered and a loud duct rumble was disconcerting. The duct problem was finally addressed with an extended intake lip. More troubling was a low pre-stall buffet that didn't provide adequate stall warning and a tendency to roll off at the stall. A 10" stall strip was added to provide acceptable stall characteristics.

Even though it was a very conventional, low-risk configuration and its handling qualities had been acceptable to North American and Navy test pilots its stall characteristics were deemed to be unsatisfactory during BIS testing and early in the Fleet Introduction Program. The stall during a power approach was considered to be abrupt and inconsistent, resulting in an unsatisfactory roll-off.

North American quickly modified four airplanes (one had also been modified with the extended engine intake duct) at Columbus with the leading-edge spoiler strip relocated to the inboard section of the wing. It was triangular in shape, 10-inches long, and mounted about two feet outboard of the fuselage. The flap shroud was also modified to act as a flap seal with the flaps retracted. Navy pilots evaluated these airplanes in mid-July 1959. The improvement was judged to reduce any roll-off at stall to an acceptable level but it was noted that the degree of roll-off varied between airplanes when the flaps were down. Careful rigging of the flaps during production or post-maintenance flight test was therefore required to eliminate any significant inconsistency.

The Navy had NACA Langley conduct a spin test evaluation of the T2J-1 with a 1/20 scale dynamic model in the Langley 20-foot free-spinning tunnel in 1957. Based on the results, the Langley engineers predicted that different control positions should be used depending on the distribution of disposable load and spin type. For erect spins at the flight design gross weight, i.e., with no wingtip tanks or external stores, the recovery was optimum with simultaneous rudder reversal against the spin and aileron applied with the spin. With full wingtip tanks and internal fuel while carrying rockets, rudder reversal was to be followed by downward movement of the elevator. For the flight design gross weight condition with partially full wingtip tanks, recovery "should be attempted" with simultaneous rudder reversal against the spin, movement of the ailerons with the spin, and jettisoning the wingtip tanks. And finally, for inverted spins the optimum recovery technique was predicted to be rudder reversal against the spin and the stick maintained longitudinally and laterally neutral.

In this instance, the NACA spin-tunnel test results proved overly pessimistic and the recovery recommendations unnecessarily situation and configuration dependent. North American test pilots conducted extensive spin testing of the T2J—including the vertical-entry testing required by the Navy—without serious incident (rockets were mounted on the tip tanks to "break" the spin when all else failed but weren't used). The resulting T2J flight manual spin recovery instructions simply stipulated that the power control lever be retarded to idle and full opposite rudder be applied with the stick held neutral in pitch and roll in all aircraft configurations. When rotation ceased, the rudder was to be neutralized and aft stick used to recover from the ensuing dive. Although intentional inverted spins were prohibited because the negative g limit might be exceeded, the recovery process was the same, even with the tip tanks partially full. Jettison of the tanks was not required. It turned out, as North American test pilot Ed Gillespie noted, *"a great airplane for unusual attitude recoveries."*

Armament training with the T-2 was somewhat realistic for the time because it was equipped with an AN/AWG-6 Fire Control System that included the AN/APB-30A Ranging Radar. The Mk 6 Mod 9 gun sight could be used for air-to-air gunnery, or to drop bombs on, fire rockets at, or strafe ground targets. An AERO 15D bomb rack could be mounted on a removable pylon on each wing. The T-2 could therefore be armed either with bombs, rockets, or a .50 caliber gun pod. Alternatively, the pylons could be used to carry sleeve or banner-type tow targets that could be streamed in flight.

The first squadron to receive the new trainer was BTG-9 (its designation was changed to VT-4 on 1 May 1960) at NAS Pensacola in July 1959, replacing the T2Vs. The T2J had been formally named "Buckeye" by the Navy the month before in recognition of its birthplace in Ohio. BTG-9 was primarily responsible for air-to-air gunnery, field carrier landing practice, and at-sea carrier qualification. At that time, the gunnery phase consisted of ten flights, four of which were live fire using gun pods slung under the wings. Only ten hops were devoted to Field Carrier Landing Practice prior to at-sea qualification, since the students had already carrier qualified in the SNJ/T-28. If all went well, the students then made takeoffs from and landings on the carrier designated for qualification at the time. Takeoffs via catapult were not very demanding but exciting.

Approaches were much more challenging and consisted of two touch-and-goes (the hook remained up) followed by four successful arrested landings. The first student to qualify in the T2J aboard the training carrier USS *Antietam* was 2ndLt J.B. Hammond, USMC, on 2 June 1960.

The last of 217 T2J-1s was delivered in April 1961. At that point, it equipped VT-4 and VT-7 of the Naval Air Basic Training Command (NABTC) in the Pensacola, Florida area and the Naval Air Technical Training Unit (NATTU) at Olathe, Kansas.

The T2J did not meet a few of the OS-141 performance metrics as determined by Navy flight test but it bettered most significantly. Stall speed was determined to be 68 knots against the original requirement of 65. Service ceiling was only 30,000 feet compared to the specification of 35,000 but it was adequate to the task. Maximum speed was 28 knots faster than the 400-knot requirement and takeoff and landing distances were on the order of 1,000 feet less than stipulated. Maximum range was 99 nautical miles greater than the 700-nm requirement and minimum endurance fell short by only 90 seconds. The Training Command got the airplane that the Navy was looking for.

T-2B and T-2C

Although the T2J-1 had adequate performance for its basic training role, it was considered to be underpowered with its Westinghouse J34 engine, which was also no longer in production. As a result, North America suggested what amounted to a complete redesign to the Navy in April 1956, a T2J variant powered by either the new Pratt & Whitney J52 or a Westinghouse J50. The new airplane would have a gross weight of 12,500 lb with a J52 engine providing 7,600 lb of thrust, more than double that of the J34. The fuselage was similar to the T2J's but wings and tail surfaces were somewhat swept to increase the critical Mach number. Combat ceiling was predicted to be in excess of 50,000 feet. Maximum speed at 35,000 feet was Mach .95; at sea level, just over 600 knots.

Instead of buying more single-engine T2Js with either modest or high performance, the Navy instead issued a contract to North American in January 1962 to convert two T2J-1s, one of the original prototypes (BuNo 144218) and one of the first production airplanes (BuNo 145997), to be T2J-2 prototypes powered by two Pratt & Whitney J60-P-6 engines derated to 2,905 lb of thrust. The change consisted of a redesign of the lower fuselage to widen it, an increase in the size of the engine intakes, and mounting structure and systems for two engines instead of one.



Tailhook Association via CDR Doug Siegfried

The twin-engined T2J-2 (later T-2B) prototype, BuNo 145997, in flight.

Going to two engines provided the increase in thrust desired an early introduction to flying a twin-engine jet with one engine out, and a hoped-for reduction in airplane loss and fatal crashes in the event of an engine failure. The first prototype flew on 30 August 1962. In September 1962, the T2J-1 and T2J-2 were redesignated T-2A and T-2B respectively.

In the basic training configuration with full fuel, including tip tanks, the T-2A had a takeoff gross weight of 11,580 lb. The T-2B was about 1,000 lb heavier, but the total thrust from its engines almost doubled the total thrust available. The 34th and subsequent T-2Bs received a 100-gallon internal fuel capacity increase with a fuel tank in the wing leading edge to offset the loss in specific range resulting from twin-engine operation. The change was retrofitted to the T-2Bs built earlier.

After a Navy evaluation of the T-2B prototypes, North American received an initial contract for 10 production T-2Bs in March 1964. The first production T-2B flew on 21 May 1965. Except for some avionics and the engines and associated systems, it was otherwise virtually identical to the T-2A. NATC began qualification tests of the T-2B in August 1965. In August 1966, three T-2Bs and a few T-37Bs were assigned to VT-7 for a three-month comparative evaluation of their suitability for the basic training role except, in the case of the T-37B of course, carrier operations. VT-7 subsequently received T-2Bs as replacements for its T-2As beginning in November. Some were subsequently delivered to VT-4, also part of the Basic Training Command, at Pensacola for air-to-air gunnery and carrier qualification. The last T-2A in the training command departed VT-9 in February 1973. Ed Gillespie, who flew most of the test work, had fond memories of the twin-engine T-2: *"The J60-powered 'B's were so much improved over the 'A's with the J34 that they were night and day. From the first flights of the T2J-1, we NAA pilots wrote internal memos criticizing the lack of performance with the single J34. The J60 was so much better and with two of them, WOW! During a climb to service ceiling, (for T-2B handbook data) we had previously decided to continue to absolute ceiling, if things were looking good at service ceiling. After climbing for another almost half hour after the service ceiling was reached, I finally 'zoom' climbed the last 500 ft and topped out in a stall at over 50,000 ft. We got it all on data but NAA decided not to advertise the fact. The airplane would also really turn (preferably below 20K") in a dogfight if a good pilot asked."*

In early 1967, Secretary of Defense McNamara almost introduced the T-37B into the Navy primary training program by fiat. For the Fiscal Year 1968 budget, he proposed that T-37Bs be substituted for most of the Navy's basic flight training requirements as they were half the cost of the T-2Bs. Only enough T-2Bs would be procured to provide for the gunnery and carrier qualification phases. Congress did not agree with his approach.

One reason for the cost differential is that Pratt and Whitney had increased the price of the J60 for T-2B production. In response, the Navy elected to reengine the T-2 with two less expensive, slightly lighter, but also less fuel-efficient General Electric J85-GE-4 engines with the same thrust rating as the J60s. The only performance penalty was a 5% decrease in specific range. As a result, North American built only 97 T-2Bs. T-2B, BuNo 152382, was modified to be the prototype for the T-2C. First flight was accomplished on 17 April 1968.



Tailhook Association via CDR Doug Siegfried

Gun pods are carried beneath the wings on this T-2C assigned to training squadron VT-23.

There were 231 T-2Cs produced with the first one closely following the last T-2B on the production line. First delivery was to VT-9 at NAS Meridian in April 1969. The T-2C eventually replaced all the T-2As and Bs, with the last of them being phased out in 1973.

However, because of a subsequent and temporary shortfall in the number of T-2Cs versus training requirements, several T-2Bs were reclaimed from the MASDC storage at Davis-Monthan Air Force Base, Arizona in the early 1980s and refurbished at the Naval Air Rework Facility at Pensacola. These were assigned to VT-10 and other units that were operating T-2Cs in a non-pilot training role to free them up for pilot training. The T-2Bs were retired for the second time in 1991.

The last class of students to train in the T-2C accomplished their carrier qualification aboard USS *Truman* (CVN-75) in July 2003. It was also the last carrier airplane to be catapulted with a bridle rather than the nose-tow system that had been introduced with the Grumman A-6 Intruder and E-2 Hawkeye in 1963.

The T-2 Buckeye series represented a continuation of a source for Navy trainers stretching back to the prewar SNJ through the T-28. Every Naval Aviator in training to fly jets between November 1959 and 2004 almost certainly flew a T2J (or T-2 after November 1962) at some point before receiving their wings.

TF-86F

In 1954, the Air Force was poised to introduce the F-100 Super Sabre into service. It was a fighter with performance that couldn't have been imagined a few years earlier. However, the T-33 training aircraft used to produce pilots for this fighter was woefully inadequate. The gap between the straight-wing, low-thrust T-33 and the swept-wing, high-thrust F-100 was unmanageable for many new pilots, and since the F-100A was a single-place supersonic jet, the use of an instructor to oversee the transition was not possible. The new pilot's first flight in an F-100 would be his solo flight. Unfortunately, the Training Command's concern was very prophetic: the early F-100 accident rate was appalling. During the first months of tactical training at Nellis Air Force Base three of the first ten F-100s were lost; as a precaution the remaining aircraft were grounded. A jet trainer with higher performance than the T-33 was urgently needed.

Lockheed's success in converting the single-seat P-80 into the two-seat T-33 jet trainer generated interest in a similar conversion of the North American F-86 Sabre. This two-seat Sabre, it was argued, would be a cost effective means of introducing new pilots to the handling qualities and transonic flight peculiarities of a swept-wing jet.

North American proposed a TF-86 to the Air Force in February 1953 and began design work on its NA-204 in April. The conversion was based on the F-86F-30 wing (with slats reinstated for good low-speed handling qualities), nose, aft fuselage, and empennage. The center section was stretched 63 inches to incorporate a tandem cockpit under a clamshell canopy. This required that the wing be moved forward eight inches to rebalance the airplane. To minimize the weight increase and center of gravity shift associated with the second cockpit, the armament was deleted but otherwise the systems and engine were the same as the single-seat F-86.

In September, the Air Force provided F-86F-30, serial number 52-5016, to North American for conversion to a TF-86 prototype. North American accomplished the modification in short order, with a first flight on 14 December 1953. The Air Force evaluated it in three different roles – first, as an instrument and transition trainer for F-86D interceptor pilots, second, as a fighter-bomber trainer, and third, as an overall T-33 replacement.

Initial flight test was promising but the formal evaluation, scheduled to begin on 1 April 1954, was delayed for several months when the only prototype was destroyed during a flight demonstration at Nellis Air Force Base, Nevada. North American test pilot Joseph Lynch crashed while attempting a roll on takeoff (the takeoff occurred in a severe crosswind and the airplane had reportedly been fully, rather than partially, fueled causing it to be heavier than Lynch expected). Within days, the Air Force authorized the conversion of a second F-86F, serial number 53-1228, as North American's NA-216.

The second TF-86 differed in detail from the first. It had the 6-3 leading-edge extension in addition to slats and a two-foot increase in wing span. Two .50-caliber machine guns and a pair of under-wing pylons were retained to allow for weapons training. The height of the vertical fin was increased and a small ventral fin was also added to the aft fuselage to increase directional stability. It flew on 5 August 1954.

Inestimable North American test and demonstration pilot Bob Hoover began a tour of Air Force training bases with the TF-86 in early September 1954, providing impromptu air shows and breaking the sound barrier with selected pilots flying along. Among these were five senior Training Command pilots who flew the converted fighter and damned it with faint praise. They



NARA via Tommy Thomason

The second TF-86F Sabre climbs to begin a test flight.

were unanimous in declaring it to be a good to excellent trainer with respect to transonic flight preparation but not good enough to prepare students for the anticipated supersonic fighters with more challenging handling qualities.

The formal TF-86 evaluation began at Tyndall Air Force Base, Florida, in late September and a similar conclusion was expressed by the assigned test pilots. The evaluation ended at Nellis in January 1955 when the Director of Flying Training terminated the test program early stating that, "further evaluation would be a waste of time since the end result is obvious." The Air Force decided to forego using the TF-86 for advanced training. The airplane was transferred to Edwards Air Force Base in March for use as a chase aircraft. It was retired in November 1958 and subsequently scrapped in 1961.

TF-100C and F-100F

With the TF-86F proving to be a dead end, Air Force Headquarters approved the acquisition of two-place dual-control Century fighters. These would not be trainers in the pure sense, but conversion airplanes with some weapons delivery capability that would serve alongside their single-cockpit counterparts in tactical units. The first two-place conversion was performed on the Convair F-102A Delta Dagger. At that time the Air Force Training Command favored side-by-side cockpits in trainers, but this resulted in a heavy performance penalty for supersonic types. As a result the TF-102A proved disappointing.

To avoid Convair's diminished performance problem, NAA funded a private study for a tandem cockpit F-100. Development of the two-place F-100 Super Sabre did not start until late 1954 when the recommendations of the study on the elongated fighter were approved. The initial example (serial 54-1966) was converted from a standard F-100C and designated the TF-100C. It acquired the enlarged tailfin of the F-100D while retaining the flapless wing of the F-100C. It was intended as a transition trainer only and carried no operational equipment. It was flown for the first time on 3 August 1956 by North American test pilot Alvin White, who demonstrated level supersonic flight proving that, unlike the widened TF-102A, the lengthened TF-100C cockpit did not inhibit performance. The Air Force issued a contract for 259 TF-100Cs but rescinded the order when it was decided to develop a two-place F-100 with full operational capability that could provide weapons training in addition to transition training. This new variant, designated the F-100F, was closely based on the F-100D with the enlarged tailfin and wing flaps. No prototype was ordered since the Air Force was already satisfied with the flying qualities of the TF-100C and those of the F-100F, with more wing area and flaps were expected to be even more benign. The first F-100F to fly was the first production article (serial no. 56-3725), which made its maiden flight on 7 March 1957. Meanwhile the sole TF-100C was lost during a spin test on 9 April 1957. Production of the F-100F ended in October 1959 after 339 units had been produced.



NARA via Tommy Thomason

An early F-100F Super Sabre during evaluation at Edwards Air Force Base, California.



NARA via Tommy Thomason

One of the 339 production F-100F Super Sabres on the backside of a loop.

Final Trainer Programs

The F-100F was the last military trainer produced by NAA. In 1978 North American Rockwell submitted two proposals for the Navy's VTXTS program intended to replace the T-2 Buckeye, but failed to receive a contract. In 1980 Rockwell International submitted another unsuccessful proposal in the Air Force Next Generation Trainer Program intended to replace the T-37 Tweet. This marked the end of an era when North American was the world's leading trainer manufacturer.

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Tommy Thomason is retired from the aerospace industry where he served as an aeronautical engineer, flight test engineer, and executive. He graduated from Rensselaer Polytechnic Institute with a Bachelor of Science in Aeronautical Engineering and earned graduate degrees from the University of Southern California and Harvard. His pilot ratings include airline transport, certified flight instructor, and glider. He has accumulated over 3,000 hours of flight time and has written eight aviation books.

The Thanksgiving Day Attack On Formosa

by Lt. Col. Reagan Schaupp, U.S. Air Force

Author's Note: When an opportunity came to share some of my grandfather David Lee "Tex" Hill's story (the American Volunteer Group, famously known as the "Flying Tigers") with the North American Aviation retirees and friends, I was delighted. As the ninth anniversary of my grandfather's passing came this past October—he would be 101 today—I reflected on a couple of Tex's characteristics that may resonate with many of you. The more I learn about North American Aviation, the more certain I am my grandfather would have been right at home with y'all—and had high praise for you, to boot!

First, I'm coming to appreciate the tremendous gifts of innovation with which the NAA team was blessed, at a time when our nation needed them most. The hundred-day sprint to roll out the world's greatest fighter, the P-51 Mustang, is a "household story" here at Air Command & Staff College, where I'm privileged to teach. (But that's only the tip of the iceberg, of course, when it comes to NAA trailblazing.) Tex was an innovator, too—by necessity. In Burma in May 1942, when presented with a P-40E and Russian demolition bombs that didn't fit, and was told, "Well, you flew a Navy dive bomber; you figure it out—the Japs are heading for the Salween Gorge, and we've got to blow that bridge somehow!" He did what NAA would have done. He figured it out, and quick!

Tex's highest praise was always for the Flying Tigers' ground crew—the maintainers and armorers who worked absolute, bona fide miracles to keep every plane in the air they could. Routinely, when asked to speak, Tex praised these mostly unsung heroes even more than he opted to praise Claire Chennault or his fellow pilots. The men behind the machines, he was convinced, were the beating heart of the Tigers' success. I am positive he would say exactly the same about the NAA team. Folks are quick to recognize and adore the fighter ace, but the whole team that puts man and machine into the fight, when and where needed, merits equal praise.

Finally, I know Tex would greatly admire the perseverance under stress that marked NAA. You pressed forward through trials-and-errors, setbacks, never enough of what was needed, a clock that was always ticking, a nation desperate for what you could create—and you succeeded brilliantly, time and again. That was Tex's outfit, too. His 23rd Fighter Group fought understrength, overwhelmed, at the end of the world's longest supply line, without spare parts or enough gas. Ultimately they succeeded, but not without their share of setbacks; they had to persevere. If the NAA and the Flying Tigers could get together, what stories they could share!

With those thoughts, I offer one of the stories we treasure most from Tex's career—the Thanksgiving Day raid on Japanese-held Formosa, 1943. It all started, like so many of your endeavors did, when someone said, "Hey, I have an idea..."

On the 22nd of November, as his staff meeting convened at Kweilin, Colonel Casey Vincent stood in front of a blown-up photograph of an airfield that had been affixed to the wall. David Lee "Tex" Hill, commander of the 23rd Fighter Group, studied the photo with a practiced eye, noting that there were a lot of enemy planes on the field.

"Gentlemen," said the smiling Vincent with a gleam in his eye, *"you have before you a photograph of Shinchiku Airdrome on the island of Formosa. There are eighty-eight bombers of the Imperial Japanese Navy lined up here wingtip-to-wingtip."* He looked around the room as the officers goggled, and finally rested his gaze on his fighter group commander.



Reagan Schaupp photo

David Lee "Tex" Hill, newly promoted to Colonel at age 28, with Col. Casey Vincent. Tex and Vincent were responsible for the entire eastern China air campaign.

"Tex, do you have any suggestions?" Vincent asked with a wink.

Tex smiled. *"Let's get 'em!"*

No further discussion was needed on that point, and the men put their heads together to decide what could make it on such a mission. No P-40 had the range to reach Formosa, even with extra fuel hung all over it; Suichwan, the closest Fourteenth Air Force base, was four hundred miles from the island. In the end, the men figured that fourteen B-25s, eight P-38s of the 449th, and eight P-51As of the 76th were all of the airplanes in China that could make the trip. Formosa had never been struck before; Vincent's reconnaissance pilots had been taking pictures of it for months, trying to figure out a way to get a raid on it. Now the arrival of the P-38s and P-51s in the theater provided that means, but they would still be sailing into uncharted waters.



Reagan Schaupp photo

Tex Hill does some quick mission planning on the hood of a jeep at a refueling stop, April 1944.

On the 24th of November, the day before Thanksgiving, a special camera-equipped F-4A aircraft—a reconnaissance version of the P-38 Lightning—took another snapshot of Shinchiku airdrome. Tex and Vincent practically drooled as they counted fully one hundred Japanese bombers on the main strip, with an even larger number of fighters parked on a side runway. Before staging into Suichwan that evening, Vincent pulled Tex aside for a word.

"Tex, I want you to take charge of this mission," he said soberly. *"It's got to be a secret. Don't even tell the men where you're going until you're about to take off. This one can't leak out to the Japs."*

Tex nodded. He could well understand Vincent's concern, for the raid presented some particularly dangerous possibilities. The aircraft would be operating at the extreme limits of their range, even taking along extra fuel tanks to augment it. They would barely have the gas to make a couple of passes on the airfield before turning for home. If the Japanese were alerted and got airborne, drawing the raiders into a fuel-burning dogfight, not a single one of the Americans would make it back. They might not even see the Japanese before being pounced on with no altitude to maneuver. Also, the mission would be navigating through an area with unpredictable weather patterns that created particularly rough cross-winds. On top of all this, in order to avoid detection, the final one hundred miles of the trip would have to be "on the deck" right across the watery Straits of Formosa. Life preservers were about as common in China as Cadillacs—there were none. However, there were plenty of Japanese fighters who dreamed of catching the Americans at that altitude and chewing them up.

"One more thing," Vincent continued. *"When you get back, give me a call on the radio. If the mission fails, the code will be 'New York.' If it succeeds..."*

"How about 'San Antonio?'" Tex grinned.

"'San Antonio' it is," Casey agreed.

As Tex prepared to depart from Suichwan the following morning, Thanksgiving Day, he went over the plan in his head. With their crews' navigation skills and equipment, the B-25s were the best choice to take the lead on the way to the target. Once there, the P-38s would go in first with their heavy firepower to strafe the field. They would be followed by the Mitchells, who would drop fragmentation bombs. The P-51s would cover the group in case of air attack, and would follow the others on strafing runs if the coast was clear. After that, everyone had better be on the way back.

At nine o'clock, after getting a good weather forecast, Tex called the pilots together. They knew something big was in



Reagan Schaupp photo

***Tex Hill as 23rd Fighter Group commander, climbing into the* "Bullfrog."**

the wind as they noticed the number of aircraft that had been collected at Suichwan, and they watched Tex intently. When he briefed them on the target, they could hardly wait to get off the ground.

The B-25s took off first. Eight of them were from the 11th Bomb Squadron, with Colonel "Preacher" Wells their leader; the remaining six, led by Colonel Irving "Twig" Branch, hailed from the newly-formed Chinese-American Composite Wing. In the nose of Wells' lead bomber rode Life magazine correspondent Teddy White. Then the eight P-38s climbed off the ground, led by Major Sam Palmer, commander of the 449th Fighter Squadron. Finally Tex took off with the eight P-51s of the 76th. When the formation was assembled, they headed out—first vectoring northward to deceive any enemy intelligence spotters below, then curving around to fly southeast.

In strict radio silence, Tex led the force of thirty aircraft toward the China coastline. After a couple of hours they reached the coast and skimmed out across the Straits at a hundred feet of altitude. The weather was good, and they had seen no enemy air activity. Tex eyed the water below, knowing that a couple of U.S. Navy submarines had been alerted to the mission and were patrolling beneath the waves, ready to pick up American pilots if they were shot down or forced to ditch. After twenty minutes over the water, the dark coastline of Formosa appeared on the horizon. The pilots took deep breaths and moved about in their seats, trying to shake the stiffness of the two-and-a-half hour flight. The fighters jettisoned their empty external fuel tanks. It was time for the curtain to go up; the mission was about to get much more interesting.

The planes pulled up to a thousand feet, and Formosa spread out before them. Shinchiku Airdrome was closer to the north end of the island, and the B-25s had pulled off near-perfect navigation: they were headed directly toward it. As the formation crossed the coastline, the P-38s accelerated away in front, and Tex dropped behind the bombers with the rest of the P-51s.

Suddenly the Americans spotted a plane coming up the coastline from the south. It was too big to be a fighter, and it couldn't possibly be American. Tex dispatched Sam Palmer in one of the Lightnings to break in that direction and take it out. The pilot of the transport plane—for so it was—must have assumed the formation ahead of him was friendly, for he made no attempt to maneuver as Palmer blasted him with all five nose guns. Tex could imagine the look of numb surprise on the pilot's face as the transport turned into a fireball.

By the time Palmer rejoined the formation, Shinchiku Airdrome was coming into view. It looked just like the photographs: scores of airplanes crammed together in long rows. Now Tex could see, in the air north of the field, a flight of Japanese bombers strung out, just coming in to land. Ground crews awaited them on the runway with gasoline trucks and ordnance to be loaded. On the ground, enemy fighter crews had apparently just received warning of the incoming Americans, for they were running toward their cockpits and taxiing for takeoff.

Tex quickly directed the P-38s to take the bombers that were landing, while the B-25s pressed on with a run over the field. Tex himself adjusted course slightly and, with the rest of the P-51s, lined up to make a pass on the field right behind the Mitchells.

The fireworks were not long in coming. Sam Palmer's P-38s pounced on the Japanese bombers, which were stuck helplessly in their landing pattern. Each Lightning opened up with four .50-caliber machine guns and a 20 mm cannon in the nose, shredding the lumbering enemy aircraft right up the line. Bomber after bomber exploded and fell spinning to earth. When there were none left, the P-38s wheeled toward the main field.

Tex and the P-51s roared in behind the P-38s. Suddenly, a Japanese Zero loomed up just ahead of Tex, flying directly away from him. Japanese pilots had somehow managed to get a few of them into the air. Tex raised his nose and lined up a relatively simple shot directly into the rear end of the fighter, which was in the unenviable position of being barely airborne and slowly fighting for altitude. Tex sent his tracers streaming into the enemy's tail and cockpit. Flames erupted from the Zero as Tex zoomed under it, and he barely avoided the now-falling fighter by breaking hard to the right. Behind him Paul Bell tore a second Zero to pieces; and as five more lifted off, they were each met by an avenging P-51. Seven Zeros soon lay in smoking ruin off the edge of the runway.

As Tex banked his Mustang around, he watched the Mitchells drone over the runway at a thousand feet altitude and release their fragmentation bombs. The hundred or so Japanese ground crewmen stared up open-mouthed, not believing the Americans could actually be overhead. When the frags hit the runway, the enemy's world came apart in a hellish maelstrom of exploding gasoline and flying shrapnel. Planes disintegrated in all directions as the bomblets tore them up in a whirlwind of fury. The field became a sea of dark smoke punctuated by the flashes of detonating ordnance. Shinchiku was taking a pounding.

Tex picked out two bombers parked on the near side of the field that had escaped destruction. He walked the fire of his four machine guns right up to them and poured lead into both, but as he zoomed past they did not burn. The rest of his flight was right behind him.

The B-25s had already turned and were winging their way back out toward the Straits, but the P-51s and P-38s weren't finished. They turned for another pass on the stricken airfield, eyes peeled for anything that still looked intact. Tex spotted another bomber on the far side, and held a medium-length burst into the fuselage until its fuel ignited and the plane



Reagan Schaupp photo

Col. Casey Vincent shakes hands with Tex Hill upon his return to Kweilin Airfield.

erupted in fire. Other American fighters were descending like vultures upon various aircraft, expending their ammunition in a paroxysm of destruction before turning out to sea.

Tex was low on ammunition himself by now, but there was no reason to save any; he had no gas for a dogfight. As he made a final turn away from the field, he spotted a group of Japanese troops who had been bathing in a river that ran by the airdrome. Diving a final time, he raked the group with .50-caliber bullets and turned for home, his guns nearly empty. Behind him, smoke blackened the sky from scores of burning planes and vehicles, and Shinchiku was strewn with bodies.

At that moment, a round of ammunition "cooked off" in Tex's overheated guns. The sharp bang made him jump, and he instinctively "jinked" right, nearly putting the P-51 into the river. He looked around frantically to see who was shooting at him. When he saw no one and realized what had happened, he had to laugh.

All thirty planes touched down at Suichwan; incredibly, a lone bullet hole in one of the P-38s was the only damage. They had been five hours in the air, and their guns and gas tanks were empty, but they didn't care. Tex headed to the nearest radio and addressed Vincent and the others listening back at Kweilin. *"San Antonio—in a big way,"* he drawled. It had been a perfect mission, and Tex had become the first P-51 pilot to shoot down a Japanese aircraft.

Shortly after the raid, Casey Vincent sent a photo-reconnaissance aircraft over to assess the damage. When the pictures came back, he was beside himself. Forty-three enemy bombers could be clearly counted burning on the runway, and between the bombers landing and the fighters taking off, another fifteen had been shot out of the air. The strike on Formosa was the most successful raid made by the Allies in the entire theater up to that time. Angry Japanese radio broadcasts announced that "all but one of the American planes were shot down" in the action; the Americans knew that when the whoppers got that big, the Japanese must have been hurt badly. Not missing the fact that it was Thanksgiving Day, Tex and his companions celebrated far into the night.



Reagan Schaupp photo

Aerial reconnaissance photo of Shinchiku Airfield, Formosa, immediately after the November 25, 1943 strike mission led by Col. Tex Hill. Forty-two enemy aircraft were assessed destroyed.

The Last Flight of Elwyn G. Righetti

by Jay A. Stout

A hell-bent-for-leather P-51 pilot, Elwyn G. Righetti remains one of the most unknown, yet compelling, colorful and controversial commanders of World War II. Arriving late to the war, he led the England-based 55th Fighter Group against the Nazis during the closing months of the fight with a no-holds-barred aggressiveness that transformed the group from a middling organization into a headline-grabbing team that had to make excuses to no one. Indeed, Righetti's boldness paid off as he quickly achieved ace status and additionally scored more strafing victories—27—than any other Eighth Air Force pilot. The following excerpt is from Jay A. Stout's new book, "Vanished Hero: The Life, War and Mysterious Disappearance of America's WWII Strafing King."

The jeep squeaked to a stop. The pilot sat motionless in the passenger's seat and stared straight ahead, drawing slow, weary breaths. All at once he grunted, sat upright, grabbed his flying gear and stepped to the damp ground. The jeep immediately crunched into gear and scooted away as he started toward his aircraft.

Block letters across the sleek fighter's nose marked it as *"Katydid."* It was named after his wife, Cathryn. Next to the name, a voluptuous, green caricature of a winged katydid struck a pose. Bare-breasted, long-legged, and high-heeled, the implausible but undeniably sexy figure conveyed a distinctly flirtatious look.

A crew chief fussed with a balky set of fasteners on the P-51's underside. The pilot watched him for a moment before moving unhurriedly around the aircraft to confirm that everything was in place. Satisfied, he leaned over and checked once more on the enlisted man.

A brisk English breeze chilled the morning and the pilot stood upright and zipped up his jacket. He reached for his leather helmet and pulled it on. After so many months of combat it was stiff with dried sweat and it stank, but the snugness of it was nevertheless familiar and comforting. He pulled the goggles that were fastened to the helmet over his eyes to make certain they were clean. Through them, across the airfield, he saw dozens of other pilots and ground crews readying for the day's mission.

He lifted the goggles back onto his helmet, stepped onto the fighter's left wing and up to the cockpit. There, he grabbed the frame of the windscreen, stepped over the canopy sill and eased his athletic frame down into the seat. A quick glance at the myriad of gauges, switches, knobs and levers confirmed to him that the aircraft was ready to start.

He waited a moment for the crew chief to come out from under the airplane to help him with the buckles and straps of his parachute. The man didn't appear and the pilot tired of waiting. He sighed and called out, *"Sergeant! Sergeant, come help me with my parachute."*

The crew chief, Don Downes, was still busy with the fasteners. *"If you can't put on the God damned chute, you can't fly the plane,"* he shouted.

The pilot's request changed to a demand. *"Sergeant! Come up here and help me with my parachute!"*

Exasperated, Downes scrambled out from under the P-51. His eyes widened when he looked up to the cockpit. Rather than a fresh-faced, shave tail lieutenant, he discovered that the pilot wore "oak leaves as big as basketballs," and packed a .45 caliber pistol in a shoulder harness. The man to whom he had just mouthed off was the 55th Fighter Group's commander, Lieutenant Colonel Elwyn G. Righetti. Righetti, a celebrated ace, was in charge of not only the 55th and its airfield at Wormingford, but virtually everything and everyone on it, including Downes.

Downes leapt onto the wing and apologized as he bent over and helped his commander settle into the cockpit. Finished, he stood upright. Righetti fixed him with a look that left no doubt that his displeasure had not passed. *"I'll see you when I get back."*



USAAF photo

***Lt. Col. Elwyn G. Righetti, 55th Fighter Group commander, shows the nose art of his P-51D,* "Katydid."**



USAAF photo

Lt. Col. Elwyn Righetti was only 29 years old when he took command of the 55th Fighter Group.

The steady strum of the P-51's engine vibrated the airframe with a gentle tremble that made it feel as if it were a living thing. Righetti loved the Mustang and especially liked how it seemed to wrap itself around him as if it were a bespoken suit, custom tailored by artisans. No other aircraft had cradled him so perfectly and there was no other fighter in the world he wanted to fly. Aside from the feel of it, the smell of gas, oil and metal reeking of a muscular little fighter comprised a unique perfume. And no flying machine could match its sleek good looks—a striking balance of purposeful power and aerodynamic efficiency.

Righetti looked across the airfield where dozens of other P-51s also sat idling. They waited for his lead. Some of the fighters, like his own silvery aircraft, wore scarcely any paint at all. Their propeller spinners were circled with green and yellow stripes and the fronts of their engine cowlings wore similarly colored checkered bands. These were identification markings specific to the 55th. But a few of the aircraft were partially painted with a sweeping olive drab pattern that covered the wings and ran back from the engine cowling, and then stretched down the top of the fuselage to the empennage. The unsanctioned scheme accented the aircrafts' trim lines and was unique to the 55th. The tails of a few of the Mustangs wore the profile of a rearing stallion on their rudders.

Righetti checked his wristwatch against the slip of paper strapped to his knee. It was marked with important particulars about the day's mission such as the takeoff and rendezvous times, the route, the markings of the bomber units that were to be escorted and the expected weather—among other important information. The slip was marked with the date, April 17, 1945. It was his thirtieth birthday and he reflected for a moment on his wife and young daughter. They would be asleep now, at home near San Luis Obispo on the ranch where he had been born and raised.



Jay Stout photo via the Righetti family

Lt. Col. Righetti with his wife, Cathryn, and daughter, Elizabeth Kyle.



Jay Stout photo via Frank Birtciel

A few of the 55th Fighter Group's P-51s wore this unique olive drab-on-aluminum paint scheme.

The 55th was assigned to escort B-17s of the Eighth Air Force's 3rd Air Division across targets in Dresden, not far from Germany's border with Czechoslovakia. In fact, the war was nearly over and there was little promise of air combat as the Allies had beaten the Luftwaffe nearly out of existence. Indeed, the Nazis were expected to surrender, or be completely overrun, during the next few weeks. It was a timeframe that neatly corresponded with the end of Righetti's combat tour as he had to fly only a few more missions before reaching the three hundred combat hours required to rotate back to the States. Regardless, he had been growing increasingly exhausted and was ready for it all to be over.

Righetti nodded at Downes who, careful to stay away from the spinning propeller, ran under the aircraft and dragged the wheel chocks clear. Checking ahead and behind him, Righetti released the fighter's brakes, added power and rolled from the hardstand onto the airfield's perimeter track. He returned the salute that Downes snapped at him and started for the runway.

The nose of the P-51 blocked his view forward and Righetti stepped on one rudder pedal, then the other, fishtailing the little fighter back and forth across the track so that he could better see what was in front of him. Other aircraft left their hardstands, likewise weaving, as they fell into a long, snaking line behind him. Crew chiefs, armorers and other support personnel held tightly to their hats and shielded their eyes from the propeller-blown dust and debris.

Nearing the runway, Righetti finished his takeoff checks and cranked the canopy closed. The growl of his engine changed timbre to a muted rumble. Behind him he saw the three squadrons that made up the 55th—the 38th, the 338th, and the 343rd—readying for takeoff. He checked his wristwatch once more and watched Paul Reese and his wingman pull past him onto the runway. Reese was flying his last mission. *"At the briefing, Righetti called me aside,"* said Reese, *"and told me that I would lead the group, form it and take it to enemy territory, and at that point he would assume the lead and I was to return to base. He pointed out that we had lost too many guys on their last scheduled mission and that we were not going to lose any more... it seemed like a very thoughtful and considerate thing."*

A few seconds passed and a flare arced skyward from the control tower. The flagman posted at the edge of the runway pointed at Reese's ship and whipped his flag over his head with a dramatic flourish. Reese and his wingman advanced their engines and started down the runway together. The prop wash from the two aircraft rocked Righetti's fighter as he pushed up his own throttle and rolled onto the runway.

Carroll Henry, Righetti's wingman, taxied into position next to *Katydid*, raised a thumb and flashed a smile. The rumble of *Katydid's* engine grew into a roar as Righetti eased the throttle forward. At the same time, he stepped on the right rudder pedal to counter the powerful torque that tried to swing the aircraft left and off the runway. More power produced more torque but Righetti reflexively kept it under control and soon he and Henry were accelerating down the runway.

At just more than a hundred miles an hour the tails of the two aircraft lifted clear of the ground and seconds later they were airborne. Righetti and Henry raised their landing gear simultaneously and climbed straight ahead after Paul Reese. Behind them the group's other aircraft chased each other down the runway and into the sky. As the distance between him and the airfield grew, they looked to Righetti like a long stream of silvery-green minnows.

Several miles out, he followed Reese and his wingman into a gentle turn back toward the airfield as the last elements of the group got airborne and joined the formation in three distinct squadrons. Righetti, with Reese, headed the 338th, while the 38th and 343rd followed in trail. With the airfield a few miles ahead, the pilots tightened the formation and accelerated in a gentle descent. This low pass over the airfield not only made it easy for the 55th to pick up an exact heading from Wormingford to the first point on the assigned route, but more importantly it was a morale booster for the men who maintained the aircraft and otherwise made it possible for the group to fly. Those same men squinted into the sky as the 55th's aircraft roared overhead. The noise from so many powerful engines rattled their chests and thundered for miles across the East Anglian countryside.

Nearing Freiberg, over eastern Germany, Righetti leaned forward and peered past his gunsight and through the aircraft's windscreen. Straight ahead, at 24,000 feet, he spotted a series of specks at the head of a great carpet of white, fluffy contrails. The specks were nearly indistinguishable from the tiny nicks and bug carcasses and motes of dirt that spotted his windscreen, but they grew in size as he led the 55th closer. Finally, he recognized the bright white squares that were painted on the tails of each of the big B-17s—the squares marked them as 3rd Air Division bombers. The 55th had made the rendezvous a few minutes early, but he suspected that the bomber crews didn't mind.

In truth, however, the early rendezvous probably wouldn't make much difference as it was doubtful that the much-beleaguered Luftwaffe would make an appearance. Still, regardless of whether the enemy showed or not, Righetti and his fighter group had a job to do. He checked to see the 38th and the 343rd separate from him and the rest of the 338th to take up their assigned positions. Spread apart, the 55th's three squadrons-flying a few thousand feet above the bomber stream-could provide better coverage than if they stayed together in one huge, unwieldy formation.

At the same time, Reese's aircraft arced up and away toward Wormingford. Righetti watched a second aircraft follow Reese. He knew this was Frank Birtciel who, like Reese, was flying his last mission. Birtciel had arrived in England with the 55th in September 1943 and completed one combat tour flying P-38s before the group made its transition to the P-51 during July 1944. *"I really liked and respected Righetti,"* Birtciel said. *"He might have saved my life during that last mission. We had lost two other guys during the previous week who were also flying their last missions. Righetti didn't want to see that same thing happen, so he ordered me to go home as soon as we rendezvoused with the bombers."*

The mission was a grueling one not because of enemy action but simply because—at more than five hours—it was so long. Protracted flight at high altitudes in an unpressurized cockpit was exhausting. It numbed the senses and the bitter cold often overpowered the cockpit heating system and worked its way through the layers of clothing that the men wore. At a minimum the missions were boring and frigid. At their worst—when beset by enemy fighters and heavy flak—they were terrifying.

On this particular mission, up to that point, it was the former. Bored and cold, Righetti and the rest of the 55th took the



Jay Stout photo via the Righetti family

Perhaps the only reasonably clear photograph of Righetti's P-51D* "Katydid" *in flight.

bombers across the target and started them on their way back to England. Below them, under attack by more than a thousand bombers, Dresden's citizens were anything but bored and cold. The bombs bounced and burned the rubble that their city had already become after a number of previous raids. Those raids killed more than twenty thousand. On this day more than five hundred additional civilians were being killed.

The responsibility for escorting the bombers was passed to another fighter group on schedule and the 55th's individual squadrons descended to look for targets of opportunity. The weather through the entire region was poor, and heavy cloud cover and haze made formation-keeping difficult. Consequently, the men tightened their formations as they dropped through the clouds.

Righetti, with Henry still on his wing, took the 338th down to just a few thousand feet and trolled the area to the north and west of Dresden. The pilots looked for whatever merited killing, to include aircraft, trucks, troops, trains or anything else that might be useful to the beleaguered Germans. As they motored through the poor visibility, calls over the radio made it apparent that other elements of the 55th were heavily engaged with enemy fighters.

There is little doubt that this information sharpened Righetti's lookout. Competitive and chronically keen for a fight, there were few missions during which he didn't fire his guns. He spotted an airfield near the town of Riesa, about twenty miles northwest of Dresden. There were a number of enemy aircraft parked at various points around the airfield and Righetti ordered the flight to stay at altitude while he dropped down to check for antiaircraft fire. Henry asked for, and received, permission to follow him. *"He wanted me to stay up there with the other guys,"* Henry said. *"But when I requested, he let me go."*

Righetti dove almost to the ground and leveled off to set up for a firing run from the east. He cranked in a touch of rudder trim to center the ball in the fluid-filled tube of his turn-and-bank indicator; an aircraft that was out of trim sprayed bullets everywhere but where they were aimed. Next, he twisted the gunsight's rheostat to adjust the brightness of the aiming pipper that was projected onto its small glass plate. Too bright and it would wash out whatever he aimed at. Too dim and he couldn't see where *Katydid's* guns were pointed. Finally, he checked that his gun switch was set to "Guns, Sight & Camera."

With Henry on his wing, Righetti spotted an Me 109 parked at the edge of the airfield. He banked slightly left and lowered the aircraft's nose until the gunsight's pipper rested on the fuselage just below the canopy. He held it there with slight forward pressure on the control stick as *Katydid* swiftly closed the range.

Righetti squeezed the trigger at the front of his control stick. The six .50 caliber machine guns—three in each wing—responded with a bucking roar that actually slowed his aircraft. Each of the guns sent armor piercing projectiles toward the enemy fighter at a rate of eight hundred rounds per minute.

Righetti released the trigger after only a couple of seconds. An instant passed before great clods of earth and grass erupted from the ground around the German fighter. The rounds which found their mark twinkled and flashed and tore pieces from the Me 109 before turning it into a fireball just as Righetti passed overhead. He looked up and immediately caught sight of an FW 190 approaching to land. Henry was closer to the enemy aircraft than he was, and Righetti called out its position and told Henry to, *"Go get it."*

"He had eyes like an eagle," Henry said. *"I didn't see it."* A few seconds of frantic searching later, Henry spotted the enemy aircraft and made a quick heading correction. Slow as he was—and with his landing gear extended—the German fighter pilot was virtually helpless. Henry framed the FW 190 in his gunsight, fired his guns, and watched his rounds knock the hapless German out of the sky. *"I killed him I guess, because he just hit the runway and rolled over. The plane was on fire when he hit the ground."*

Righetti saw the German aircraft crash in flames. He wrenched his own ship around in a sequence of sharp, treetop-level turns while enemy gun crews, fully alert now, tried to shoot him down. Puffs of light antiaircraft fire burst around him as he lined up for another run. More antiaircraft fire crisscrossed his flight path, and smoke from the aircraft he and Henry had already set ablaze drifted skyward. Notwithstanding the efforts of the German gun crews, Righetti set several more aircraft afire.

This wasn't the artful, twisting, aerial ballet that was air-to-air combat. That sort of fighting demanded superb gunnery and a deft touch on the controls. Indeed, the skill required to cause a stream of bullets fired from an aircraft moving in three dimensions

to arrive at the exact same point in the sky—and at the exact same instant—as another aircraft moving in those same three dimensions, was not easily acquired. Very few pilots were good at it. Righetti was one of them and had proven it during the previous months by single-handedly downing seven German aircraft.

But strafing parked aircraft was different. The targets didn't move and consequently the physics necessary to achieve a satisfactory firing solution were relatively simple. A pilot only had to hold his aircraft steady and put the gunsight's pipper on the target until he flew into range. Then, just a few seconds on the trigger delivered enough rounds to tear any aircraft apart.

But it took strong guts! Indeed, there was no more dangerous mission for a fighter pilot. This was a fact borne out by the records as many more fighters over Europe were lost to ground fire than to enemy fighters. This was primarily because an aircraft flying a straight, predictable flight path low to the ground was vulnerable to the batteries of guns that typically protected important targets. The enemy gunners needed only to shoot far enough ahead of an attacking aircraft to stand a reasonable chance of hitting it.

Or—together with other gun crews—they could simply create a curtain of fire through which an aircraft had to fly. These types of concentrated barrages became especially deadly as the Germans retreated into an ever-shrinking area and brought their antiaircraft guns with them. Indeed, as the war drew to an end, the concentration of antiaircraft guns on the Luftwaffe's remaining airfields was devastating.

Indeed, by the time he started his third run, the gun crews at Riesa were fully ready. He picked out another enemy aircraft, lowered the nose of his aircraft and held it down. Finally in range, he squeezed the trigger and saw his bullets arc over the airfield and into the German fighter.

An instant later Righetti heard a loud bang and felt *Katydid* shudder. Immediately after being hit, Righetti called that he was losing oil pressure. Carrol Henry watched antiaircraft rounds streak past Righetti's *Katydid*. *"I saw a burst,"* he said, *"and I saw the plane losing coolant."* Henry called over the radio and warned Righetti that his aircraft was streaming the water and glycol mixture that was so critical to keeping the engine operating within its temperature limits. It was the P-51's Achilles' heel. Oil system aside, without coolant the engine overheated and seized-often within just a minute or so.

Righetti's reputation as an extraordinarily aggressive pilot was well known, but his subsequent actions, especially considering the reality that his engine was about to quit, and the additional fact that he was still under fire from the antiaircraft guns that were positioned around the airfield, was almost farcical. *"I have enough ammo for one more pass,"* he called. Instead of limping away toward relative safety, Righetti hauled his aircraft around through several more hard turns, dropped down to the deck and shot up another aircraft.

Although certainly too caught up in the moment to consider it, so much of what he had written home to Cathryn and his family—and much of what they had written to him—became suddenly, terribly and dreadfully real and relevant. I'm going off to war now, Mom... Words can't express what a really wonderful game this is… Don't be a fool, Bud… If I get home… I love you more than I ever have before… You don't get knocked off until your number comes up… Hope this isn't too ugly… I wonder too, occasionally, if I'm changing a little….

Henry tried to follow Righetti. *"I called him, telling him that I was tacking on. He acknowledged, saying that he was heading west on 270 degrees. I was about 3,000 feet and overran him due to excess speed gained while letting down. He was at six o'clock, behind me and I rolled out on 270 degrees."*

Henry pulled his throttle back and made several turns as he tried to regain sight of his commander. It was no good—Righett was nowhere to be seen. Likewise, no one in the 338th orbiting overhead was able to track his aircraft through the haze.

It was only a short time later that his engine gave up. Righetti opted to crash land rather than bail out, and he pointed *Katydid* toward an open space in the Saxony countryside. He left his landing gear tucked in the wings. If he landed on rough ground with his wheels extended there was a good chance they might snag on something and send the aircraft somersaulting.

The silver fighter touched down and the shriek of its metal underside ripping across the ground drowned out every other sound. It decelerated violently and Righetti's face smashed into the gunsight; he had forgotten to lock his safety harness. An instant or two later, *Katydid* heaved to a stop. Aside from his heavy breathing there was no sound but a faint ticking as the hot metal of the dead engine cooled and contracted.

Still seeing stars, Righetti called over the radio. *"Tell the family I'm okay. Broke my nose on landing. It's been a hell of a lot of fun working with you, gang. Be seeing you a little later."*

Righetti was never seen or heard from again.

About the Author: Jay A. Stout was born in Indiana and graduated from Purdue University. Commissioned into the United States Marine Corps in 1981, he flew fighters during a twenty-year career that included 37 combat missions during DESERT STORM. He currently works as a senior analyst for a major defense corporation. Stout's new book, "Vanished Hero," *details the life, combat career and possible fates of this great fighter group commander.* Vanished Hero *is his eleventh book.*



U.S. Army photo

Lt. Col. Righetti's wartime decorations were posthumously presented to his daughter, Elizabeth Kyle Righetti.

My First Combat Mission: Piloting a B-17 Flying Fortress

by Capt. Ron Lissner

That morning, at 3:30 a.m., was cold and damp. I was freezing in the penetrating chill of Bedford's pre-dawn. I couldn't keep my knees from shaking and my teeth from chattering. I didn't want to admit to myself that it wasn't entirely the biting winter English weather that was making physical control so difficult to maintain. I hadn't slept very well last night. I was terrified; I was scheduled to fly my first combat mission. The shuttle rounded the Quonset and then slowed to a crawl allowing those from our squadron to hop on. It was a five-minute ride through the darkness to the mess hall, with only the slits of light coming from the blackout headlamps of the jeep lighting the way. It became colder as we lumbered around English farms on the way to the utility buildings. Unlike the American bases, the army utility buildings, airstrips, hangars, runways, and revetments were interspersed with farms and moors. This made the airbases "difficult to find" targets for the German bombers.

Was I the only one who was making his first combat flight that December morning? I must be the only one who didn't know what to do or what was ahead. I was glad my crew wasn't with me. I wouldn't want them to read the fear and anxiety that I was sure was written all over me. I was scheduled to fly copilot with a crew that was going on its fifteenth mission. This was how the Air Force broke-in a new crew. A first pilot would learn the ropes of flying combat from an experienced crew. I would be with these men for my first two missions; at least that was the plan. My navigator, bombardier, copilot, and crew would also fly a mission with other crews.

I knew we were near the Mess hall. The smell of coffee and frying bacon hung heavy in the foggy air. The food was hot and plentiful. You got fresh eggs if you brought your own, as did most of the officers who didn't care for the GI scrambled (powered) eggs. They would bicycle out into the countryside and buy eggs from the farmers. The fellow in line ahead of me gave the cook an extra egg with a nod in my direction. Did everyone know I'm turning to jelly inside? *"Thanks,"* I offered, *"Sunny side up, please"* to the cook. At the end of the line, my tray was loaded. The servers were overly generous. I hadn't asked for anything; I wasn't thinking about food. The coffee did warm me, but I couldn't eat. The "up" egg just kept staring at me and I felt that was what most of those at my table were doing. Outside, a whistle sounded. Everyone picked up his gear, had his last swallow of coffee, and boarded the shuttle. We headed for the flight line and briefing on our mission.

The briefing room had an elevated platform that was faced by rows of chairs. The front wall was covered with slate boards and hinged map display panels that held flight routing formation diagrams. These boards were covered for security reasons. The members of the various crews were gathered together in tight groups. There was much chatter going on. Someone called out my name. It was the pilot of the crew I'd be flying with. Bill introduced himself and his crewmembers. He seemed like a nice sort and assured me I'd catch on, and would be able to relax, once we got underway. A whistle sounded three shrill blasts. The roar of talk faded as the crews came to standing attention. The Group Commander, Operations Officer, and Intelligence (S-2) Officer had entered the room and were on the platform. *"Crews be seated."*



Ron A. Lissner photo

Ron A. Lissner as a new Flight School graduate.

The Group CO made a brief statement regarding the importance of hitting today's target, BINGEN, GERMANY. Our mission was to destroy the marshaling yards. They are located at a junction of rail lines near the Rhine River. The Germans were using the area as a staging point for supplies and troops going to the front. Visibility should be good, but cloud cover, now over the Channel, was moving inland and might become a problem. The 306th Bomb Group would be putting up 36 B-17s. The Group Navigator and S-2 Officers continued the instruction. Pulling the covers off the wall mounts and using aerial photographs and maps, they explained areas of formation, assembly, course altitude, and approach path to the target. S-2 reported what kind of air resistance and ground fire could be expected and alternate targets if cloud cover prevented bombing the primary. There were instructions regarding areas considered safe to make an emergency landing. The Operations Officer gave the times and order of take-off for each squadron.

Bill wanted to get out to the plane and make the preflight ground check. As copilot, I was to second him, calling out the checklist and reviewing the ground chief's report of service/maintenance. As we finished the check, the other crewmembers arrived in a personnel carrier, piled out, and stowed their gear in their respective areas.



Ron A. Lissner photo

The crew of Capt. Ron Lissner's B-17 Flying Fortreess. Top row, left to right: R.A. Lissner, Pilot; C.J. Britton, Co-pilot; F.G. Robbins, Navigator; F.E. Ballish, Bombardier. Bottom row, left to right: V.L. Fennerty, Radio Operator; H.R. Bemetz, Armor; E.J. Baryla, Left Waist Gunner; L.M. Miller, Engineer; W.H. Cranford, Ball Turret Gunner; G.W. Beck, Tail Gunner.

It was not daylight when the tower gave us the signal to take off. Brakes on, steering column back, and engines full throttle – tower says GO – brakes off! With a lumbered jerk, our B-17 started her takeoff run. Carrying a full bomb load, this -17 wasn't eager to leave the ground. The tail came up and, with a bit of a groan, she left the ground. Airborne, it was as if there was no longer the weighty burden in her belly. Maintaining a steady rate of ascent, we flew our prescribed course in the overcast. On instruments, we held fast to the directed rate of ascent and heading; depending on those planes ahead and behind us to fly just as true to the prescribed course.

Six minutes passed before the grey clouds outside began to lighten to white. As we flew up out of the undercast into the light, the cloud mist clung to our wings and whirling propellers. The first rays of the sun were hitting the aircraft that were ahead and above us. In the distance, more -17s were popping up out of the billowy white field with long white arms of cloud vapor reaching after them, not wanting to let go of them. This was one of the most unforgettable sights that stays forever in a pilot's memory. We were on course and climbing; we would rendezvous and pull into our assigned position at 6,500 feet. A gradual climb would bring us to 26,500 feet before we started our bomb run. Formation flying was pretty loose with plenty of space between planes until the "Lead" radioed, *"Tighten it up, boys."* Then I went all white knuckles and cold sweat. We were lining up for the run!

The target was clear. The flak spotty, but showed increasing accuracy as we started the bomb run. Then came a shaking experience! I saw, for the first time, the burst of flak shell in the air space just ahead of us. Out there, where the air was clear, there was suddenly a great black cloud seeming to get larger and larger as our plane sped into it. We were still two minutes from our target and the tracking anti-aircraft guns were "place firing," to establish our altitude and speed. The pilot had taken over the controls at the beginning of the run. Even though he was concentrating on the readiness of the bombs and fighter opposition reports, he had anticipated and observed my reflex reaction to the first flak. I jerked and involuntarily pushed backward in my seat. It was a reflex reaction to put distance between the explosion and myself. The pilot offered, *"You don't have to worry about the ones you can see. It's the flak you don't see coming that gets you!"* I think this was supposed to have a calming effect. Later flights bore out the truth of his comment. More than once, during a mission critique, the comment, *"and they never even knew what hit them"* was heard.

The lead ship opened its bomb bay doors, and all the ships of the squadron followed suit. The bombardier toggled off the lead. *"Bombs away!"* The plane bobbed slightly, relieved of the bomb load.

Just as the bomb bay doors closed, there was a hail-like sound tearing through the cockpit. The armor plate under our feet and seats bounced upward. Our Number Three engine and gas tank had been hit. Gas was flowing into the bomb bay, radio cabin, and waist areas. We had taken a flak burst and Bill was wounded. He signaled, *"Take the controls,"* and called for the first aid kit. His wound was in his thigh, right where the armor plate under his seat stopped. If we hadn't been sitting on those thick plates, we both would have been knocked out. I feathered number three engine and ordered no use of the radio as the area was filled with gas fumes. The risk of using the radio to report our problem was too great. One crewman reported that he had observed a hit on one of our planes right after bombs away. He said it appeared to have taken more than one shell and went spiraling down into the smoke and haze. He didn't see any chutes.

We lost about 5,000 feet of altitude before gaining control. Bill told me to try to keep with the formation, but we were steadily falling behind. I adjusted back the throttles on Number One and Two engines, and increased power on Four to compensate for the loss of Number Three. We were about 6,000 feet below the formation now and encountered more flak as we crossed Ostend. It was there that our Number One engine quit; that prop had to be feathered. With a compress on his leg to stem any bleeding, Bill was back at the controls. It took the two of us to keep a flight attitude that would enable us to hold altitude. The navigator gave us the heading to Maston, the near mile-square RAF emergency field in the south of England. We limped across the channel, making the coast at 3,000 feet.

A two-engine landing can be trying, but having unending runway of seemingly endless width did make our set-down fairly easy. The medics took Bill to the base hospital. The rest of the crew was taken to a receiving area to be checked over and fed. I filed the forced landing report. We would be flown back to our home base in the morning.

I'd had my baptism of fire. I'd seen first-hand what responsibilities combat conditions put on the First Pilot. I had seen how he and the crew had shouldered what was necessary and had methodically handled crisis situations. I was ready now. I have a good crew. They have trained hard and know their respective jobs and obligations. As a team, we will fly those missions putting the USA that much closer to victory.

About the Author: Captain Ron Lissner, USAAF, was a B-17 pilot during World War II. He is 93 and resides with his wife, Bari, in San Clemente, California. He is still sharp and in relatively good health. On his 15th mission, his plane took two flack hits at 25,000 feet over Berlin. The plane lost two engines and the oxygen system. On one of the engines, the prop could not feathered, which induced a considerable amount of drag. He immediately descended to a lower altitude due to the lack of oxygen. The plane had no chance of getting back to England, so he established a heading towards neutral Sweden. He successfully performed a forced landing on the coast of Sweden, and fortunately, none of the crewmembers were seriously injured. He and his crew spent the remainder of World War II in internment. He was the First Pilot in the 367th Bomb Squadron of the 306th Bomb Group. While interned, he was appointed Aide to General Alfred A. Kessler, Jr., the American Air Attaché to Sweden. This article was written 40 years ago and was first published in the 306th Bomb Group newsletter, "Echoes."

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Doors open for Social at 10:00AM, Lunch starts at 11:30AM
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A P-51 Mustang Shot Down a C-47

by Colonel Kenneth Tollefson, USAF (Ret.)

During a recent visit to the Pima Air and Space Museum, we entered Hangar #4 to view a beautifully restored Boeing B-29 when I happened to notice a splendid P-51 Mustang handsomely restored and bearing the name "Bad Angel." *Proudly displayed on the side of the fuselage were the markings of the pilot's kills – seven German, one Italian, one Japanese and one AMERICAN! Huh? What? One AMERICAN? How did that happen? One of the well-informed docents at the museum was able to relate to us the events that led to this strange oddity!*

In 1942, the USAAF needed pilots for its many warplanes. It needed lots of pilots and Lt. Louis Curdes was one. At 22, he graduated flight training school and was shipped to the Mediterranean to fight the Nazis over Southern Europe. He arrived at the 95th Fighter Squadron, 82nd Fighter Group in April 1943 and was assigned a P-39 Lightning. Ten days later he shot down three German Bf 109s. A few weeks later, he downed two more Bf 109s. In less than a month, Louis had become an Ace.

During the next three months, he shot down an Italian Macchi C.202 fighter and two more Bf 109s before his luck ran out and he was shot down by a German fighter on August 27, 1943 over Salerno, Italy. Captured by the Italians, he was sent to a POW camp near Rome. A few days later, Italy surrendered. Louis and a few other pilots escaped before the Germans could take control of the camp.



U.S. Army photo

Lt. Louis Curdes stands in front of the P-38 Lightning showing his kills against five Bf 109s over Italy in 1943.

Returning to the U.S., he volunteered for another combat tour. This time he was sent to the Philippines where he flew P-51 Mustangs. Soon after arrival, he downed a Mitsubishi reconnaissance aircraft near Formosa. Now he was only one of three American pilots to have kills against all three Axis Powers: Germany, Italy and Japan.

Until this point, Lt. Curdes' career had proceeded to a predictable conclusion. Here, however, it departed the predictable and introduced an entire new set of conditions worthy of a Hollywood conclusion!

While attacking a Japanese-occupied airfield on the Bataan peninsula in the Philippines, one of his wingmen was shot down. The pilot managed to ditch in the ocean and survived. Louis remained in the area to protect the downed pilot and guide a rescue plane.

It wasn't long before he noticed another, larger airplane with wheels down, preparing to land at the same Japanese-held airfield on Bataan. He moved in to investigate.

Much to his surprise, the approaching plane was a Douglas C-47 transport with American markings! He tried to make radio contact without success. He maneuvered his Mustang in front of the big transport several times, trying to wave it off! NOTHING! The C-47 kept heading to the airfield. Evidently, the C-47 crew was oblivious that they were about to land on a Japanese-held airfield and would soon be captives.

Having read daily news accounts of the viciousness of Japanese soldiers towards their captives, Louis knew that whoever was aboard the C-47 would be, upon landing, either killed or wished they were. But what could he do?

Audaciously, he lined up his P-51 directly behind the transport, carefully sighted his .50 caliber machine guns and knocked out one of its two engines. Nothing! The C-47 continued on toward the Bataan airfield. Louis shifted his aim slightly and knocked out the other engine, leaving the baffled pilot no choice but to ditch in the ocean. The big airplane came down in one piece about 50 yards from his bobbing wingman.



U.S. Army Air Forces photo by Quentin B. Porter

Louis Curdes' P-51D Mustang,* "Bad Angel" *photographed during a wartime Pacific Press Tour in April 1945.

At this point, nightfall and low fuel forced Louis to return to base. The next morning, he flew cover for a PBY that rescued his downed wingman and the 12 passengers and crew from the C-47, which included two female nurses. All survived, and Louis would eventually marry one of the nurses.

For his action in shooting down the C-47, Lt. Louis Curdes was awarded the Distinguished Flying Cross and was credited with another kill. The fuselage of his North American Aviation P-51 Mustang, *"Bad Angel,"* displayed the tally: seven German, one Italian, one Japanese and one *American*.



William Simone photo

A closer view of Louis Curdes' P-51 showing the panel displaying his aerial victories.



William Simone photo

The restored North American P-51D Mustang in the markings of Lt. Louis Curdes'* "Bad Angel" *on display at the Pima Air and Space Museum in Tuscon, Arizona.



Charles H. Lowry photos

On October 12, 2016, Chuck Lowry visited the Parachute Museum located next to the National Museum of the U.S. Air Force in Dayton, Ohio. Before leaving the museum, he took a moment to relax and reminisce on the North American Aviation Memorial Bench.

Dear Readers of the NAA Retirees Bulletin

by Michel Juif, Editor Emeritus



This is the end of an era: I feel sad to learn of the demise of the NAA Bulletin.

I feel that I must give you, all faithful readers, the story of the Retirees Bulletin as it is known today.

Prior to 1996 it was known as the Retiree's News (RN). It started as a simple letter created by Engineer Manager Bill Barker in the 1970s; Bill was the creator of the Hovercraft. He promised some of his employees that had retired or moved far away from the company that he would keep them informed of the company's activities; so once in awhile, he had his secretary type a letter that he named Retiree's News. Eventually the letter was in greater demand and it grew in size and volume. Bill needed help and asked his good friend Earl Theaker to take charge of the RN to have printed and published. Later the company took charge to print it and to mail a copy to the many recipients. The RN was a good public relation for Rockwell and did continue to finance the seasonal publication; which grew to over 2,000 issues and mailed 4 times a year.

In May 1989 when I retired, I was asked if I could help preparing the RN for printing. We were using the method of cut and paste for letters from retirees, stories, obituaries, photos, etc., all the full pages were copied by Xerox machines. Al Kustra was the editor of the RN when I joined the group, I was the only one to have an IBM Computer at home; at work I was teaching Computer Assisted Design (CAD) to Engineers. I decided to use my knowledge of computers to prepare the pages of the RN at home. Al Kustra was so impressed with the improved look of the RN that he asked me to take over the entire operation and so I became the new editor of the RN. I had many volunteer friends willing to help in any capacity like answering the telephone and write the information given to appear on the RN, most of them were for the Silent Majority columns that I created. I delegated this task to a good friend, Walt Jones, (who is now part of the Silent Majority). Walt had also a computer at home; he was a great help. Other helpers were used to proofread, collate and add pages numbers. After final inspection the bundle was then sent on to the company for photocopies, addressing and mailing.

The RN office had to change place several times; in 1968, the LAD Recreation Center was sold to LAX and we had to be relocated to the Space Division Downey Recreation Center. This is where I met J. Leland "Lee" Atwood for the first time. He had called the office to meet me and my staff for a business meeting. He was very pleased with the RN and wanted us to add Aviation related stories: he gave several articles to publish... Of course! Like the P-51 Mustang, his creation, and many others.

Lee was the former CEO of North American Aviation. He was not happy when North American Rockwell became Rockwell International and saw the title of his beloved company vanish. Lee called me at home frequently and introduced himself to my wife and wanted to speak with Michel. This how he became one of my best friends. He chose me to be a reporter for special events where he was honored, such as, the dedication of a new street in El Segundo with his name, the "J. L. Atwood Way" for one and the Westchester Walk of Fame, as the city was honoring famous Aerospace persons. Lee and Bob Hoover were among the recipients of a plaque on the walk. Then another event was the visit of Apollo Astronauts in Downey. I recall John Young of Apollo 10 as one of the speakers.

On March 8 1994, it was a sad day; my friend, J. Leland Atwood passed away at the age of 94.

All went well until 1996, when Boeing acquired NAA from Rockwell and announced that they wouldn't support the Retiree's News. When this unexpected bomb fell on us, we were ready to ship the boxes to the Post Office containing the last issue printed by Rockwell. We had to open all the boxes fast and inserted an important Notice in each issue that stated: "This is the RN last issue, Boeing refuses to support the production of the RN and we have no funds to continue."

This Notice produced a big reaction from the recipients; we received an avalanche of letters from them. (Several hundreds, I am guessing?) Some were already sending money for the continuation; we received enough donations to enable us to pay for the printings and mailings of the next issues to those who wrote for a continuation. We also had the help of the Bald Eagles, Inc., our affiliate. Their Treasurer did set up an account at their Bank solely for the transactions of the RN. We had to require a subscription for the magazine and we did set it at $10.00 a year for 4 seasonal issues.

In the Spring of 1997, from Downey we launched our first issue that we named North American Aviation Retirees Bulletin. We were told to vacate this latter facility and move to Boeing, Seal Beach. A small office was provided for us by George Wiley, a corporate officer of BNA.

The year 1997 had a sad ending for me, my spouse passed away on December 21st after 44 years of marriage. I was lonely and depressed. Nevertheless, I continued to go to the Boeing office one day a week with my good friend Walt Jones. I had other volunteers in my staff that came to the little office. One staff member, Ken Fowler, came from far away, Yucaipa, San Bernardino County. Other staff members were Jesse Mendez and Maxine Hawn. Then came Mr. Ed Rusinek. This gentleman did great things for the Retirees Bulletin. He was a proofreader, he found a reliable Printer and took charge of the mailings, he also negotiated with Boeing Postmaster to provide a mail box for us inside Boeing to receive the incoming mail. I liked the way Ed worked so efficiently and I thought, *"This man, I want him to be my successor"* and in the year 2000, Ed took over as Editor of the Retirees Bulletin and he did a great job. Don't you think? Thanks Ed.

Farewell to all.

— Michel

Contrails from the Past

by Ed Rusinek

Dear Ed,

Well done! You and your Bulletin team fought the good fight, finished the race, kept the faith and documented the individual remembered moments, that when combined, formed the brilliant nova of aviation history that was North American Aviation. For all who contributed to that history in the company or through association with its products and programs, here is an update of Tennyson's *Ulysses* for the age of aerospace:

There lies the stand. The rocket vents its tank. Above looms the infinite dark sea.

Companions - souls that have toiled, and wrought, and thought together – who in youth dreamt fleet fighting Mustangs and swift striking Sabres – we now are old. Old age has yet its honor and its toil.

Death closes all; but something ere the end, some work of noble note, may yet be done, not unbecoming those who strove with Nature and invoked the strength of Atlas and Titan, the speed of Mercury, the thunder and lightning of Jupiter and Thor, and the wisdom of Saturn.

The stars begin to twinkle in the sky. The long day wanes. The Apollo conquered moon climbs.

Come, best and never resting companions: 'tis not too late to seek a newer world. Lift off, with fire and thunder's roar, for our purpose holds to fly beyond the sunset, and all the baths of all the western stars with our craft, Mariners in the empty sea, which Voyage on even after we are dust.

Though we have not now that genius which in old days traversed from earth to heaven, that which we are, we are – one equal temper of minds once brilliant as the moon and stars we strove to reach, made dim by time and fate, but still bright with Curiosity and will to Explore, to Pioneer, to Rove, to Range, to Survey, to Challenge, to Endeavor, to Discover, for all mankind.

May God always grant you clear skies and tailwinds.

— Steve Evans, Foothills Ranch, CA

Ed's Ans.: I have always felt that the folks who comprised North American Aviation from Dundalk to the Skies over Berlin, over Afghanistan and on the surface of the Moon were not simply thrown together but rather bound together as the strongest Family there ever was! Thank you Steve for your beautiful words so well spoken!

Dear Ed,

You and your volunteers put together a truly great Bulletin like no other that I have ever seen. The stories and pictures will be missed by all of us at the monthly breakfast get-togethers.

I enjoyed the *"The Last Word"* story including the bit about the Detroit City Airport. My brother would drive us, 17 and 13, in our Dad's 1937 Terraplane, to that airport and we would watch the DC-3s come and go.

We will miss you, the Volunteers and the NAA Retirees Bulletin that kept us together. Bravo to you all for your splendid efforts.

— Stan Thimakis, Tustin, CA

Ed's Ans.: Thank you for those kind words, Stan. You were one of our biggest contributors for all three NAA Memorial Benches. You are all fantastic people and I am glad to call you "Family."

Dear Ed,

Thank you for your long time effort in keeping our NAA Retirees Bulletin going. Your continued contribution will always be remembered and appreciated, especially by those of us who are original NAA employees.

All your contributors who produced those wonderful, historical and interesting articles made it a success.

— Georgiana Winden, Las Vegas, NV

Ed's Ans.: In all sixteen years of publication, none of our contributors ever asked to be paid, including those who made a living writing and painting. That is why I always called them "NAA Family" because for at least that moment, they were "Family."

Dear Ed,

We are saddened by the coming to an end of the Bulletin. My wife, Joyce, met and married in 1963 while we both worked at the Downey facility. Both of our Fathers, John W. Fleetwood, and Clifford C. Lawrence, worked almost their entire working lives there.

I remember growing up in Downey when a large gate at the end of the runway on Imperial Blvd. would be swung open and traffic stopped whenever planes took off as a safety precaution. We lived in Downey and Joyce was even Mayor of Downey.

I worked there for 18 years with some great people and learned a great deal while honing my skills in aerospace.

Happy Trails to All from Colorful Colorado!

— Roger Lawrence, Dolores, CO

Ed's Ans.: I spent a year out in the shop as a Material Review engineer, Grey Badge, and I came nose-to-nose with Manufacturing Superintendent John Fleetwood on many occasion because Quality Control was totally in fear of him and paged me to disposition all serious screw-ups. John did not tolerate anything that interfered with SCHEDULE!

Dear Ed,

Thank you and your volunteers for the effort it took to publish the Retirees Bulletin. My wife, Vivian, and I enjoyed every issue and it seemed that every issue got better than the last one.

— John R. Andres, Seymour, TN

Ed' s Ans.: We are often asked what Publisher puts our Bulletin together every quarter so professionally! We tell them it is put

together by the best creative writers, informed researchers and copy editors available and a fine graphic artist, Bryan Hori.

Dear Ed,

Thank you for all the work you did over the years in preparing, editing, publishing, editing and sending out the NAA Retirees Bulletin!

— Peter A. Price, Los Alamitos, CA

Ed's Ans.: Any success achieved by a small team such as ours must rely on every member doing their best. Our team far exceeded "their best" for 16 years! They were Superb!

Dear Ed,

I want to personally thank you for all these years of putting your heart and soul in the NAA Retirees Bulletin. You had some great volunteers and with your leadership you overcame the multitude of barriers and bumps that came along. All of us looked forward to receiving the Bulletin with the wonderful articles, recollections, artwork, photos, letters and, of course, the Silent Majority. My words can't adequately express my appreciation for your personal friendship and your accomplishment for all of the NAA family.

— William "Bill" Dean, Santa Ana, CA

Ed's Ans.; You can be a great leader but without the talented folks I happened to recruit, we would have never survived the first three months. This was augmented by all the others-the authors, pilots, artists, astronauts and the others that, at least for a single issue, became full time NAA Family, and we aren't done yet!

Dear Ed,

You and your volunteers have done a superior job all these years and I do admire your dedication. I will miss seeing the NAA name and logo as I am sure many other retirees will. We were all fortunate to have worked for such a great company and on so many projects which have enriched all our lives.

I am 90 years old. I was 1 year old when my parents took me to the airport in St. Louis to watch Charles Lindbergh fly back the *Spirit of St. Louis* back to that city. We have truly lived in a wonderful time and I wouldn't have missed it – it has truly been a great ride!

— Bettye Etzel, Hays, KS

Ed's Ans.: It is people like you that made us feel that we were simply sharing news and information with FAMILY. It is because you all are FAMILY. God bless you All!

Dear Ed,

I was privileged to have my article published about my time aboard the USS *Skate*, SSN-578 on its first polar crossing and surfacing at the North Pole through the ice cap in 1958. We used our NAA Inertial Navigation System taken directly out of the XSM-64 Navaho Missile and installed in the first nuclear submarine to prove we could navigate under the polar ice cap. It was a pleasure working with you and observing your attention to detail throughout the publishing process.

— Roger Schmidt, Ogden, UT

Ed's Ans.: Your article will join all the others on a disc that will remain available to every American!

Congratulations and Best Wishes to

Willis and Marilyn Hardy of San Juan Capistrano, California
celebrating their 70th Wedding Anniversary

Robert and Florence Franta of Santa Maria, California
celebrating their 65th Wedding Anniversary

Roger and June Schmidt of Ogden, Utah
celebrating their 65th Wedding Anniversary

Roger and Joyce Lawrence of Dolores, Colorado
celebrating their 52nd Wedding Anniversary

I asked the Lord in heaven above,
to help me find someone to love.
A caring person, loyal and true...
He heard my prayer and sent me you.



Stan Stokes

Aviation Art

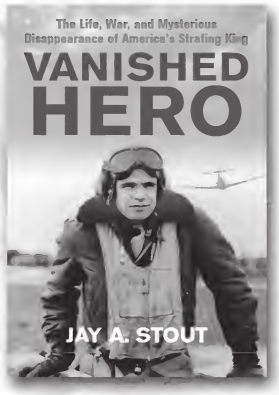
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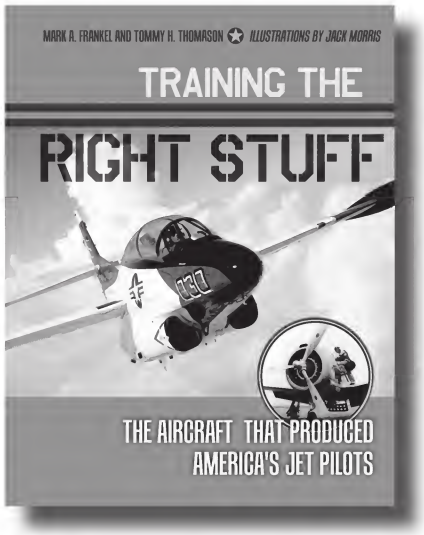
—Robert Gandt

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—Eric Hammel

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CDR Doug Siegfried, Tailhook Association historian



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SCHIFFER PUBLISHING

MEMORIES OF THE APOLLO AND SPACE SHUTTLE PROGRAMS

by Larry Korb

A new book by our Science Editor, Larry Korb, will be available through Amazon (amazon.com) and Barnes & Noble (barnesandnoble.com) in January 2017.

It is a comprehensive document on the Apollo and Space Shuttle Programs. It covers the design and materials used in building the Apollo Command and Service Modules, the Launch Escape Tower, the Spacecraft Lunar Module Adapter, the Lunar Module, the Lunar Rover, and the Space Shuttle Orbiter and Shuttle thermal protection system, detailing the design challenges we faced and had to solve.

The book compares the features of the Russian *Buran* with the Space Shuttle Orbiter. Larry discusses how we beat the Russians to the Moon and covers the causes and resultant failure analyses of the Apollo 1 Fire on the launch pad, as well as the causes of the *Challenger* and the *Columbia* spacecraft inflight disasters.

All sixteen manned Apollo Missions are reviewed. The book also provides a description of how the Space Shuttle Orbiter reentered the atmosphere—dissipating its more than two trillion foot-pounds of kinetic energy as heat. (Only 10% of the energy is the result of skin friction.) The legacies of both the Apollo and the Shuttle Orbiter are covered in detail. Finally, a topic close to the author's heart is: *How we lost the Manned Spaceflight Program*. Read about all the mistakes that brought this about.

Did you know that Americans spend a lot more yearly on Halloween than on the Manned Space Program? The book discusses the commercial spacecraft serving the International Space Station and the future manned ones under contract. It presents the challenges that must be addressed in a manned Mars mission and the future plans of other nations for participation in Space.

Available as a hard cover, paperback, and an e-book; 488 pages, 39 chapters and over 100 illustrations.



John Tribe photo

The night before the Grand Public Opening of the Heroes and Legends exhibit at the Kennedy Space Center Visitor Complex on November 11, 2016, a large evening reception was held for former Astronauts and those who worked on America's Space Program. Attendees Lee Solid and John Tribe take a break from the night's festivities on the North American Aviation Memorial Bench.

The Silent Majority

by Stan Guzy



HOOVER, ROBERT A., "BOB", 94 – of Palos Verdes Estates, CA, a world renowned pilot noted to perform amazing feats with an airplane powered on or with a "dead" stick, died on October 25, 2016. Few among Southern California's early icons of flight could duplicate his melding of Man and Machine in flight. Captured during World War II, he walked out of his abandoned camp at War's end, found a flyable German Fw 190 and flew back to his base. His many accomplishments include surviving five separate crashes. He was considered one of the best "stick and rudder" pilots in the world.



IACOBELLIS, SAM, 87 – died of a stroke on September 3, 2016 after taking a nasty fall at his vacation home in Cayucos, CA. Sam joined North American Aviation as a draftsman after receiving a degree from Cal State Fresno. He later received an M.S. degree in Engineering from UCLA. The B-1 was first ordered by President Nixon, later cancelled by President Carter and, finally, entered production in 1981. When President Reagan ordered 100 B-1B bombers to be built as quickly as possible in response to the threats of the Soviet Union, Sam was selected to manage this huge undertaking. All 100 airplanes were delivered in six short years, only to be overshadowed by the Northrop B-2 and the howls of Communist "peesniks." However, to this day, the B-1B still is used as the "first responder" to any crisis requiring convincing that this country still can respond to any threat against it or its Allies.

BOWMAN, CHARLES, 84 – died at Altercare in Canal Winchester, OH on August 24, 2016. Chuck graduated from Tri-State University in 1953 with a B.S. degree in Radio Engineering. He joined NAA at the Columbus Division and retired from the Palmdale facility in 1992, having worked on the T-28D Mod, T-2 Buckeye trainers and OV-10 programs.

BROWN, MARIAN L., 85 – of La Mesa, CA passed away on August 23, 2016. Marian joined NAA in 1959 where she served as secretary to Test Pilots Bob Baker and Scott Crossfield for 12 years. A splendid musician, she will be remembered as the charming hostess that arranged the many elegant yearly Quality Departmental Christmas Dinner-Dances. After departing from NAA, she successfully operated a Secretarial Service/Public Notary business for 43 years.

OGLE, TERRY D. – Bulletin returned, stamped "Deceased." Terry retired in 1988 from Space with 41 years of service.

RICHEY, RUBY I., 93 – of Harbor City, CA passed away on September 9, 2016. She retired from the Corporate Offices in 1987 with 26 years of service.

WILKERSON, HOWARD M. – note received from Sedona, AZ that Howard passed away on July 23, 2016. Howard retired from LAD in 1978 with 28 years of service.

WINNINGHOFF, VINCE, 85 – passed away in Laguna Niguel, CA on September 14, 2016. Vince retired from Autonetics in 1986 with 30 years of service as a Contracts Administrator. He was active in youth activities and served as a founding member of the Laguna Niguel Little League.

LOST SHEEP, BULLETIN RETURNED WITH NO FORWARDING ADDRESS

MAXINE S. HAUN – IRVINE, CA

BLANCHE P. HENKE – VISTA, CA

WAH D. LEE – LOS ANGELES, CA

ROBERT L. LEMONS – MERIDIAN, ID

NORMAN PARKER – SAN ANTONIO, TX

"Don't be dismayed by good-byes. A farewell is necessary before you can meet again. And meeting again, after moments or lifetimes, is certain for those who are friends."

— Richard Bach

NORTH AMERICAN AVIATION
RETIREES BULLETIN
P.O. Box 3797
Seal Beach, CA 90740

North American Aviation Retirees Bulletin
"Where The Best Never Rest"

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"A Pistol Whipping" *printed with permission of the Artist*

Flying a mission in his P-51 Mustang on June 28, 1944, Capt. Arthur Fiedler, Jr., of the 317th Fighter Squadron encountered two Messerschmitt Bf 109s over Ploesti, Romania. After shooting down the first Bf 109, Fiedler's guns jammed, and he was extremely low on fuel. Unwilling to make himself a target and finding himself flying next to the other enemy pilot, he instinctively pulled out his sidearm and aimed it at him. The panicked foe, in turn, jettisoned his canopy and bailed out! Veteran aviation artist Stan Stokes captures this startling moment in his painting **"A Pistol Whipping."** ***Colonel Arthur Fiedler, USAF (Ret.) resides in Oxnard, California with his charming wife, Helen.***

A Bald Eagles Inc. Publication

North American Aviation Retirees

Bulletin

NAA RETIREES

WINTER 2000

Season's Greetings

Inside:
Viewing a Shuttle Launch (STS-92/Discovery) - By Ed Rusinek
A Son Remembers His Father, Edgar Schmued—By Rolf Schmued



The Space Shuttle (STS-92/Discovery) Crew

From Left to Right

Standing: Astronauts Leroy Chiao, Michael Lopez-Alegria, William McArthur Jr., Jeff Wisoff, and Koichi Wakata

Sitting in Front: Pilot Pamela Melroy and Commander Brian Duffy

North American Aviation Retirees

Bulletin

DEAR NAA RETIREE NEWS READER:

Hooray! Hooray! We are back! Thanks to some generous contributions we have enough "seed money" to start publishing the new NAA RETIREES BULLETIN on a limited scale. As you know, Boeing has withdrawn all financial support, so we have to ask you to subscribe if you wish to receive our publication.

Since most of you are not aware of our return, we are taking a big chance and sending this issue to all our previous 8300 free subscribers with the hope that they will send us the $10.00 fee. The ten bucks will buy you the next four quarterly issues plus a membership in the Bald Eagles, Inc., regardless of the length of employment you had with the company. If we don't hear from you, we will assume that you are not interested and this issue will be our final communication.

Why not take a few minutes and fill out the little membership form on this page and send it along with your check. If you like to be sure someone else should also receives this publication, double the amount of your check. And give us their name and address. We will drop them a post card, telling them of your generosity! Please make all checks payable to Bald Eagles, Inc.

Use of the form below is not mandatory, it is only a convenient way of subscribing. If you want to preserve your issue and not cut out the form, you may just write us a note and give us the same information that are on the form. If you wish, affix one of your return address label in lieu of writing your address by hand

If you have already sent us the $10.00, you are paid up through the four issues for 2001. This will simplify our bookkeeping if everyone comes due at the same time. If you have sent $20.00 you are paid up through 2002. If you sent $100.00, you have bought yourself a lifetime membership! Your name will be added to the Silver Eagles. Whatever you sent, God Bless!

The above information supersedes the statement made in the Editor's Corner (Fall 2000 issue), in reference to the annual fee lapsing after the Spring issue.

Motions were made at the BOD meeting on all above pertinent matters and were approved unanimously, including the elimination of the 25 years requirement for Bald Eagles membership. All Retiree Bulletin readers are also Bald Eagles members.

MEMBERSHIP FORM

RETIREES BULLETIN OFFICE
PO Box 3644, M/C SJ51
Seal Beach, CA 90740-7644

Yes, I am a retiree of NAA/Rockwell and I want to be a member and receive the NAA Retirees Bulletin. I am enclosing a check payable to the Bald Eagles, Inc. for $ _____
For every $10.00 I will receive four issues.

Name _____
Street Address _____
City/State/Zip _____

I retired from_____ Division
After _____ Years of Service

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B.J. & Ken Schell
William Schleich
Tod Snelgrove
Rex Tabor
James L. Thresh
Andy Tindley
Stanley White
Melvin Wilson
Lee Wiltsie

NAAR is an affiliate of the **Bald Eagles, Inc.** and is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAAR office is located at Boeing, Seal Beach facility. Send mail to:
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2600 Westminster Blvd
PO Box 3644, M/C SJ 51
Seal Beach, CA 90740
Or call: ☎ (562) 797-3836
Or Fax: (562) 797-3848

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Howard "Bill" Axtell & Walt Jones: "Silent Majority"
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Joe Onesty, Betty Richardson,
Walt Spivak, Bill Stolz,

"To grumble is Human. Men Grumble because they are served turkey in place of goose, or vice-versa. Grumbling is as necessary to most men as fleas are to dogs. A reasonable amount is good for both of them, as it keeps them interested in life. It is the almost invariable rule that men who grumble mean nothing by it. Too much grumbling, however, will get any man in wrong in time and it is best to limit this art to whatever is necessary for the man's pleasure in life."
U.S. Navy Blue Jackets Manual, 1940 edition

NAA/ ROCKWELL/BOEING RETIREE CLUBS and GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Bill Kelley (714) 637-9374

TheAntelope Valley Retiree Club meets at 10:00 AM every 2nd and 4th Monday of the month at the Palmdale Fitness Center. All North American retirees are welcome. For more information call (805) 265-3488.

The Boeing Valley Retiree's Club meets on the 3rd Thursday of each month at the Canoga Park Rec. Center. 8500 Fallbrook Ave. Canoga Park, CA. President: Jennie Muncaster (818) 341-8919

Autonetics Retirees meets for lunch at 11:45 AM on the 2nd Wednesday of each month at the Rembrandt Restaurant, 909 E. Yorba Linda Blvd., Placentia CA. All Autonetics retirees, spouses and friends are invited.

"Ye Olde Pharts Breakfast Club" meets for breakfast every 4th Thursday of each month at Coco's in Orange.

A group of NAA Retirees meets for breakfast on the 1st Wednesday of each month at the Knott's Berry Chicken Farm Restaurant at 8:15 AM. All are invited.

"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meets for lunch on the 2nd Wednesday at 11:30 AM at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd & Mariposa Ave.

"The Old LAD Stress Group" meets approximately every two months at Mimi's Café in Torrance, CA for breakfast. If you were in the old LAD Stress Group and want to join them, contact Gene Laxton (310) 378-3113 or Ed Rosenthal (310) 375-8933

The Downey Engineering Group of Retirees known as "The Choir Boys" meets every Thursday for lunch at various restaurants from Seal Beach to Downey. Call Al Risi at (714) 892-5725 for meeting location.

GPS Breakfast Club meets every Wednesday morning from 6:00 to 8:00 AM at the Primrose Restaurant at the corner of Seal Beach Blvd and Westminster Blvd. All are invited, retired or not.

The Facilities, Industrial Engineering and Plant Services Retiree Group meets on the second Thursday each month at the Jolly Roger in the Long Beach Marina at 11:45 AM. Friends and wives, former and current employees are welcome.

The North American Rockwell Retirees Club of McAlester Oklahoma (a satellite of Tulsa, OK) meets each month on the 3rd Tuesday, 10:30 AM at the Down Town Meeting Place. For more Information contact:

J. A. Darden, 343 W. Adams Ave. McAlester, OK 74501 or phone (918) 423-0706.

Tulsa & McAlester Retirees meet for breakfast at 8 AM on the second monday of March, June, September & December at the Harvest Buffet, 3637 S. Nemovial Drive, Tulsa. Call Harry Phillips for more detail call (918) 838-3716.

The North American Rockwell Retiree Group of Columbus, OH. Engineers and Professionals meet each month on the 3rd Thursday at 11:30 AM at the Berwick Park House. For more info. contact Byron C. Solomides (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH, meets on the 1st Monday of each month at Noon at the Old Rockwell Park (North Hamilton Rd.) E. Hamilton (740) 927-5940.

Autonetics Group that includes Marine Systems, Program Office, Project Office, System Test, Engineers, Designers, etc. meets for lunch on the last Wednesday of each month at the Hometown Buffet, Rose Avenue and Alta Vista Drive in Placentia. For more information call Mike Vohs (714) 762-1925.

A group of NAA Retirees from 101 Tooling meets for breakfast at 10:00 AM on the first and third Thursday of each month at the Cimarron Café at 5160 190th St., West of Anza Avemue in Torrance.

Annual Specials

The "Warbird Round-Up", sponsored by the Santa Maria Museum of Flight - August, 2001

Bald Eagles Reunion - The 39th Annual Reunion is on April 21, 2001

Grants Pass Picnic - 1st Wednesday after Labor Day, September 5, 2001

Tri-State NAA / Rockwell Reunion - Usually meet in October at the Elks Lodge, Bullhead City, AZ. Call Diane Millard (520) 758-1554, Bill Eng (520) 758-5685 or Roy Elwell (520) 754-3175 for information.

NAA-K B-25 Reunion is held yearly at the Wyandotte County Museum. For more information call Harry J. Desko (913) 287-7223 or write to him at 3024 N. 47th St., Kansas City, KS 66104.

Flying Horsemen For year 2001 ROWDY-O contact Bob Morse's home in Grants Pass. Phone: (541) 474-1438, or by mail to PO Box 415, Murphy, OR 97533.

The Hangar Gang - This group of retirees meets approximately every 6 months. For time and date or additional information call Gene Salvay (818) 788-3974, or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

Annual Flight Test Instrumentation Reunion - This group of retirees meet annually at the Fullerton Elk Club. For Information call Ed Mosbrook (714) 531-8060 or Frank Vigil (562) 691-0236.

If your group of retirees is not included in the CALENDAR OF EVENTS, please notify us either by writing to the Retirees Bulletin Office at our Seal Beach address, or by calling (562) 797-3836. Be sure to give us the name of your group and/or a nickname, if you have one. Use the "Who, What, When, Where" format as in the examples above. A person to contact for information and a telephone number would also be very useful.

Another Recreation and Fitness Facility Bites the Dust.

Boeing's facility (formerly Autonetics) in Anaheim is closed forever .

The center was built by North American Aviation in 1962 and Rockwell International ran it for 30 years.

Not only, was it a great place for employees and retirees to keep in physical shape, but it had many other activities and clubs.

There were company picnics and retirees luncheons. It also hosted the Ceramic Club, the Radio Club, the Photography Club, the Mineral Club and even a Gun Club.

Other groups also held their meeting there, such as the Masonic Aerospace Club and Ham Operators.

Cynthia Kroll, a UC Berkeley economist who has studied the aerospace industry said, "There was a different view of corporate life then. In many ways, the company provided a whole setting for a person's life, not just a paycheck."

Boeing, which took over local operations from Rockwell in 1996 has sold the 20-acre property on Mira Loma Avenue to another undisclosed business.

To date the bulldozers have begun to leave their marks and are in the process of demolishing the buildings and clearing the land. Viewing the site is very depressing and has angered many employees and retirees, some of whom made their feelings known by e-mail missives to higher-ups.

Boeing officials declined to name the buyer or the price, pending escrow, but sources said the buyer is in the surf-wear business.

A similar, but smaller, Fitness Center will open soon in Huntington Beach for Boeing employees

Send us mail for the Mail Bag—Andy Tindley is waiting for your letters. Also don't forget that you can put ads in the Mail Bag if you have something that you want to sell or that you want to buy (No charge for this service, OK!).

MISCELLANEOUS INFORMATION

All NAA / Rockwell / Boeing Retirees that have a need to contact the BNA Benefits Center must have their Personal Identification Number (PIN) available before attempting a call to the Center.

The telephone Number is 1-800-438-3116. The business hours are from 10 AM to 6 PM (EST) M through F.

If you don't have one or forgot your PIN, you must write to the Center:

BNA BENEFITS CENTER
PO Box 24567
Jacksonville, FL 32241-4567.

Services provided by the Center are:

Life events, enrollment or change in medical/dental plans, address changes, plan comparisons of medical benefits, answers to general health/dental/vision and life questions, health care/Life Insurance direct billing procedures and confirmation statements.

The above information does not apply to retirees from the Rockwell Corporate Offices. These former employees remain under the Rockwell Corporation benefits and pension plans

Other Services Available to Retirees

Only the Boeing California Employee Fitness, Inc. location at Seal Beach is available to Retirees. To access the facility, retirees must exchange their Retiree Card for a temporary badge at Gate 510 on Westminster Blvd.

Discount tickets to recreation parks are no longer available at the Fitness Center. However, there are a couple sources still available.

Employee Services discount tickets:

1.) www.Boeing.esvp.com/, if you have internet: call 1-877-641-7283

2.) Through employee EASI discount ticket program: call 1-888-608-2911

Disneyland and other parks accept AAA and AARP memberships for discounts.

Retirees on tours wishing to rent a car can benefit from the Boeing Corporate Discount.. The company negotiated contract agreements are:

No. 5555501 for National and No. 147616 for Alamo.

Refer to the pertinent number when negotiating a rate for car rental at National or Alamo. Have your retiree ID card with you all the time

NEW OFF THE PRESS

THE NORTH AMERICAN P-51 MUSTANG
BY LARRY DAVIS

A photo chronicle. Begins with Mustang production in early 1941 initiated by the British order for 320 aircraft with Mustang 1, RAF s/n AG345 rolling off the assembly line on April 1941. The latest P-51D, considered the ultimate Mustang, the lightweight P-51H and twin Mustang F-82 are also covered.

SCHIFFER PUBLISHING.
112 pp, ISBN: 0-88740-411-1, PAPERBACK, $19.95

Look at back cover before peeking at text below.

WWII aircraft on the Back Cover: 1 - B-17 Flying Fortress (Boeing); 2 - B-26 Marauder (Martin); 3 - B-24 Liberator (Consolidated); 4 - B-32 Dominator (Convair). How many did you identify correctly?

BY ED RUSINEK,
Staff Reporter

VIEW A SHUTTLE LAUNCH (STS-92/DISCOVERY)

Although, it has been twenty years since my last visit to the Kennedy Space Center and over 30 years since I was assigned here as the Reliability Project Engineer for SC009, the first unmanned Apollo, and Apollo 7, the first manned vehicle after the Apollo I fire; this was not a sentimental journey for me into the past. The purpose of my visit was to finally see a Space Shuttle launch!

Arriving at T-2 Days, I drove down the Beeline Expressway from Orlando to Cocoa Beach and was almost swamped by a fast moving squall. The rain persisted and the prognosis for a launch on time was very gloomy. The Cocoa Beach / Cape Canaveral area remains the same as I remember it in many ways yet different in others.

Probably two of the most popular Cocoa Beach restaurants in the old Apollo days, Alma's and Bernard's Surf, are still in business. However, the restaurant on top of the new bank building is long gone and the building itself looks decrepit. The Polaris Motel with its notorious Mouse Trap bar has been demolished and replaced by a huge restaurant. I wonder if they got rid of the hordes of palmetto bugs (cockroaches) at the same time when they tore the buildings down.

Cape Canaveral has also experienced change. Evidently, the once vaunted museum displaying salvaged Spanish gold coins has been opted into a huge sex shop. I did not venture to go inside so I cannot discuss its attributes! The Fat Boy BBQ, so often mentioned by Walter Cronkite during his Apollo launch visits, is still here but of little greasy consequences. Port Canaveral is expanding its facilities to accommodate the lucrative cruise lines but one of the lines has already gone under (only financially!).

As your credentialed member of the Press, I went on a T- 1 Day orientation tour of KSC, which allowed me the opportunity to observe the changes that have been incorporated since I was part of the launch team. First stop was the Vertical Assembly Building (VAR). Although four of the huge bays were used to prepare the complete Saturn/ Apollo vehicles, only two of the bays are now being used to stack the Space Shuttle with a third kept available as a haven in case of a rollback because of hurricane dangers at the pad.

Just northwest of the VAB is the Shuttle Landing Facility with its 15,000 ft long x 300 ft wide runway with 1,000 ft extensions at each end. From there, the orbiter is moved on the towway to the Orbiter Processing Facility (OPF) almost adjacent to the VAB. Entering the OPF, we did a walkaround ATLANTIS that had landed at KSC two weeks earlier and was being prepared for its next mission. The vehicle had been jacked up off its wheels and extensive tile replacement and repair had been completed. Interestingly, the orbiter thermal tiles being used to replace damaged tiles are all being custom made here on location within this small industrial complex.

The three Space Shuttle Main Engines (SSME's) had been removed from ATLANTIS and sent to the SSME OPF next door. We were offered the opportunity to visit that facility and were given a short tour by one of the accommodating technicians. As we were leaving, I asked him his company affiliation. He answered, "Oh! I'm Boeing Rocketdyne. Are you familiar with my company?" I responded, "I knew your company when it was only the Propulsion Group in Downey, California and all the engineers had pieces of German V-2 rockets strewn all over their desks!"

A visit to Launch Pad 39A was somewhat dampened by another short cloudburst, so taking good pictures of the Space Shuttle on the pad was somewhat dubious. Some of the Press had cameras worth tens of thousands of dollars and they toweled them down with growing anxiety. I had no such problems with my $ 69.00 Nikon!

As our tour bus drove around the launch pad, I noticed a group of people setting up what looked like rural mailboxes or small dog houses on top of posts on any slight rises next to the road, all pointed at the stack. I asked one of the media people what they were doing and he informed me that they were commercial photographers setting up their cameras in these little shelters from the rain. Since we were so close to the pad it was obvious that the people could not be present at time of lift-off. The cameras are triggered to shoot by acoustic devices, which initiate the action when the SRBs ignite with a roar. The cameras track the vehicle for only a few seconds after it leaves the pad. Incidentally, if this method results in one or two excellent still shots, the photographer is very happy with the results.

The next stop on the tour was at a relatively new building (located just east of the Operations and Checkout Building), called Space Station Processing Facility. In this building, modules destined for the International Space Station are brought in for a final checkout before loading into the delivery Shuttle. I noticed that the Canadian arm designed for use on the ISS is a telescoping design, compact and much shorter than the Shuttle arm when stored. Some of the ISS trusses are too large for this facility and are housed in the 0 & C Building.

Launch Day started with a bright cloudless morning. It looked like a great day for a launch! About 1:00 PM in the afternoon, the Press Site received the disheartening announcement. Examination of photo evidence from the previous mission indicated that the Aft Right Attach Bolt between the ET and Orbiter did not retract properly and "almost 3 in. remained protruding". The mission was scrubbed until the following night. The next morning it was announced that the Pogo Accumulator Recirculation Valve, which must open at T-12 Seconds, did not cycle properly and would have to be replaced. This would take an additional three days. In this timeframe another hardware issue was found and cleared but then the weather closed in and caused another one-day slip. Finally, six days after the original scheduled date, DISCOVERY appeared ready to go.

It was a perfect liftoff as DISCOVERY began its eleven-day journey to rendezvous and dock with the ISS. DISCOVERY will deliver two major segments of the ISS, an exterior framework called the Zenith (Z-l) truss and a third mating adapter. These units will be attached to the ISS using the Shuttle robotic arm

Coming here was a sentimental journey after all.

About the Shuttle

The 28th flight of the Space Shuttle DISCOVERY, that occurred on October 12th, 2000, marks the 100th mission launched from Kennedy Space Center. STS-92 (also designated as International Space Station Flight 3A) will continue the preparation of the ISS for its resident crew. Out of 100th flights designed for each orbiter, DISCOVERY will be the most-flown Shuttle after completion of the STS-92 mission. DISCOVERY'S primary payload, the Zenith (Z-1) Truss, is the cornerstone truss for the ISS. This component carries many critical items for the Station's attitude, communicators, thermal, and power control systems.

BY ROLF SCHMUED

A SON REMEMBERS HIS FATHER, EDGAR SCHMUED

My father's story is the fulfillment of the American Dream where a young immigrant with ambition and perseverance rises to the top of his profession.

Edgar Schmued was born on December 30, 1899 in Hornbach, Germany of Austrian parents. His father was a dentist. Edgar, the eldest, had two brothers and three sisters. He was not a distinguished scholar but he was fascinated by the technology of the day, which involved aeronautics. He read and studied anything he could find pertinent to aviation.

Toward the end of World War I, he was old enough to enter the Austrian military service and fortunate enough to be assigned to a ground support unit within the air service. The war soon ended but the interest in aviation remained. He found work in a machine shop, which gave him some practical experience. He designed a small sports plane but it led to a dead end because Germany was not allowed to build aircraft.

Edgar met and married Luise Heyne and in 1921 had a son, Rolf. With these added responsibilities, he sought to come to America. However, the immigration quotas made it very difficult to enter the United States. Therefore, in 1924, Edgar decided to immigrate to Brazil where entry was much easier. Luise and Rolf would follow when he became established in Brazil.

He was hired by General Motors of Brazil as a supervisor of dealer service facilities, which involved extensive travel throughout Brazil. This gave him greater knowledge of mechanical systems and how to work with people. But it was only a step in his wish to come to America and become an aircraft designer.

In 1930, Edgar received his visa to come to the United States. He found work at Fokker Aircraft in Hasbrouk Heights, New Jersey. His first assignment was to design a hinge. Other assignments and responsibilities followed.

However, what happened next was totally unexpected. Through a series of mergers and acquisitions, Fokker became Berliner-Joyce, than General Aviation and, finally, North American Aviation, Inc. By this time, Edgar had advanced to the position of project engineer for the YO-47, a three-man observation plane for the U. S. Army Air Corps.

In 1933 he felt secure enough to send for Luise and Rolf. This was the first time the family was together since he left Germany except for a one-year



Luise and Ed with their son, Rolf, on the left

stay in Brazil. There the family was torn apart when an adjacent building collapsed and Luise sustained major injuries. She and Rolf returned to Germany for extensive medical treatment.

Dutch Kindelberger became president of NAA and in 1935 decided to move the company to California. Luise, yearning for some sort of stability in her family, persuaded Edgar to remain on the East Coast. He went to work for Bellanca Aircraft but after only a month he decided to rejoin the NAA team in California. Unfortunately, that decision led to tragedy!

In Indio, less than two hours away from their destination there was a head-on car crash. Luise died at the scene and Edgar had multiple leg fractures as well as many lacerations on his face. He almost lost an eye. He was in the hospital for six months and another six months on crutches.

It was here that his NAA family closed ranks. The Richard Thaiss family took Rolf in while Edgar remained in the hospital. Almost every weekend, one of Edgar's NAA associates would take Rolf and drive up to visit him in Indio. Once he was out of the hospital, Chan King faithfully drove Edgar to and from work in his 1930 Ford roadster with the right door open and Edgar's leg out on the running board to allow for the huge cast on his leg. Rolf remains touched to this day by the compassion and care shown him and his father by so many wonderful people!

Edgar had a very difficult time dealing with Luise's death. It was not only the feeling of loss after all the years of separation but also the feeling of guilt, although the accident was clearly not his fault. His salvation was his work. He immersed himself in all the latest scientific studies and breakthroughs. It was during this period he defined his concepts for military aircraft. In 1936, Dutch Kindelberger promoted Edgar to Chief of Preliminary Design. They were both visionaries and they made a great team with Dutch on the selling end and Edgar on the design end.

In 1940, with World War II exploding, they were ready and the Mustang P-51 was born. Readers of the NAA Retiree News are familiar with the P-51 and its role in helping win the air war of World War II. However, the success of the plane would not have been possible without the leadership of these two men and the spirit of camaraderie and cooperation exemplified by such men as Dick Schleicher, Ed Horkey, John Young, Larry Waite and so many others, too many to mention, from test pilots to sheet metal workers. These men virtually lived the project day and night to get the first airplane designed and built in the legendary 100 days!

As Chief of Preliminary Design, Edgar, of course, was involved in the design of other NAA aircraft but it is the Mustang for which he is best remembered. When the war ended it was necessary to adjust and scale down to a peacetime economy. The pace and the pressure were gone and with them, the thrill!

In 1952, Edgar left NAA and accepted the position of Vice President of Engineering with the Northrop Corporation. There he played a significant role in the development of the T-38 trainer and F-5 fighter aircraft. In 1957, he was appointed to the Northrop Executive Committee where he felt too isolated from his first love, engineering. He resigned from Northrop.

He decided to go out on his own and, over the following years, was involved in a variety of ventures and consulting projects. These included a "throwaway aircraft" to carry individual soldiers over a battlefield and a method of reducing emissions from an automotive combustion engine. At 79, he went to Taiwan to teach young Taiwanese engineers how to design and build automobile engines. However, his health started to falter and he eventually moved to Oceanside, California where he was welcomed as an aviation pioneer.

Although not as well known today as he was during his active years, the technical community always recognized

ED SCHMUED/ Page 7

ED SCHMUED, continued from page 6

his contributions. Having served on the USAF Scientific Advisory Board, he was presented the Exceptional Service Award in 1962. He was also appointed a Fellow and, later, a Vice President of the Institute of Aeronautical Science, a Fellow of the Institute of Aeronautics and Astronautics as well as a Member of the National Advisory Committee for Aeronautics.

Edgar Schmued said he did not want to live if he could not work at his profession. On June 1, 1985, he died while in the midst of negotiations with Ryan Aircraft to perform some consulting work. He had lived a very productive life and had won the respect of his family, his associates and the pilots that flew his planes. In 1991, Edgar Schmued was invested in the International Hall of Fame at the Aerospace Museum in San Diego.

Editor's Note:
Ed Schmued in his early days at North American Aviation in the cockpit of an airplane on the right. Lest we forget, Ed was also the creator of the well known NAA logo, the famous flying bald eagle inside a triangle



THE P-51 MUSTANG WAR DIARY

January 11, 1944 – Mustangs were revealed for the first time by the Army Air Force as being in use as long-range fighter escorts for heavy bombers; although the P-5l Bs had been used as "top cover" for the bombers since December 1, 1943. The Mustangs flew with the heavies, estimated at close to 1,000, on a raid that virtually obliterated three German fighter plane assembly plants on the outskirts of Berlin. During the attacks on Oserschleben, Halberstadt and Brunswick, Mustang pilots shot down 15 enemy planes and damaged many more of the estimated 100 Nazi fighters that attempted to intercept the bomber formations.

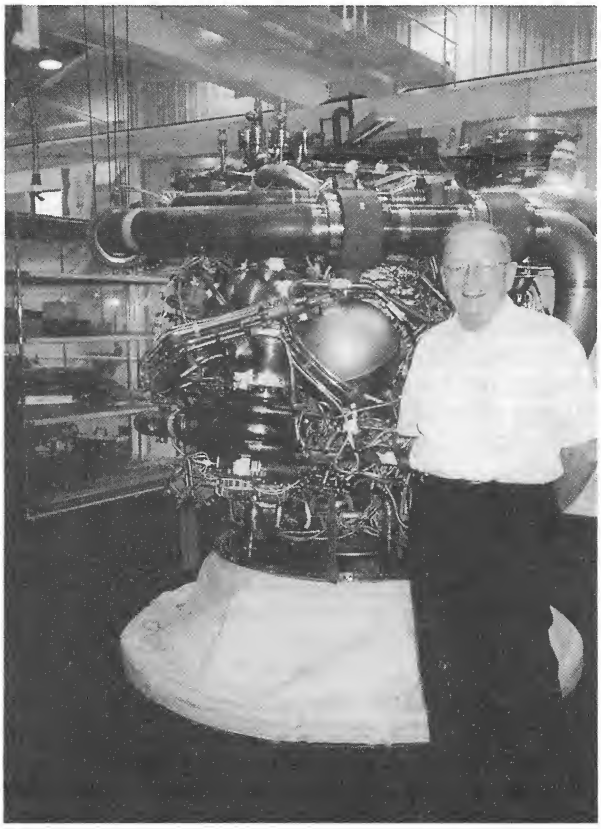
The Mustangs, led by Major James Howard, made the deepest penetration into Germany of any Allied fighters, flying more than 400 miles into the heart of the Reich. En route home, Major Howard distinguished himself by single-handedly protecting an entire combat wing of bombers from attacks by 30 Nazi planes. Separated from his unit, Major Howard dived and climbed and twisted in his Mustang through vertical miles of sky, firing at members of the Luftwaffe trying to reach the bombers.

When all of his guns but one had ceased firing, he bluffed the German pilots into breaking off their attacks, continuing his lone "flying circus" for a half hour precious time for the bombers. During his 30-to-1 battle, before he dove out of sight on the tail of a Nazi, Major Howard claimed two enemy planes destroyed, two probably downed and one damaged.

From "The P-51 Mustang War Diary" published by NAA in 1944.

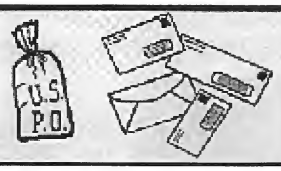
Doolittle's B-25s Over California!

Four North American Aviation B-25 Mitchell bombers were spotted last July on the Chino Airport ramp in Southern California .
They will be featured in the final moments of the forthcoming Disney movie "PEARL HARBOR". They will be used to recreate the famous Doolittle raid flown on April 18,1942.
Although the insignias and the bogus tail serial numbers correctly represent the B-25B block used by the Doolittle raiders, the planes are actually from the late 1944 B-25J series with a forward mounted dorsal turret plus waist and tail guns locations



ED RUSINEK at the Kennedy Space Center, FL
Seen here with one of the three Space Shuttle Main Engines removed from ATLANTIS for servicing at the Orbiter Processing Facility

THE MAIL BAG



By Andy Tindley (310) 325-6770

E-Mail: AndyOber@Juno.com

I Found It!

While picking up a prescription at the Fullerton Prescription center I found a fall issue of the North American Retirees Bulletin. I was delighted to find that you had picked up the publication as a function of The Bald Eagles.

I don't know that I am eligible to be a Bald Eagle, but I am anxious to be on the mailing list for the retiree news. While at the aircraft division in El Segundo I was in Human Factors doing escape system test work for the F-100, F-107, X-15, and the B-70. At the Space Division in Downey I was in Life Sciences doing test work on the crew equipment. I then returned to El Segundo, doing escapes systems and crew equipment testing. I retired in 1985 with twenty-six years or service.

I have missed the Retiree News. Thank you and your staff for making it available again.

Many Thanks,

Glenn Patton 1917 N. Lyon St.. Santa Ana CA. 92705
Tel: (714) 543-5762, glennpatton@msn.com

Andy's Note: Word of mouth is our only way to inform retirees about the revival of the Bulletin. Keep passing the word. Our Editor and staff wish we could have notified all prior subscribers, but it wasn't to be because of the way we went out of print with the Retiree News.

Warbird Round-up

I was very pleased to receive the Fall 2000 issue of the North American Aviation Retirees Bulletin and learn that the Bald Eagles, Inc. has picked up the ball in maintaining contact with alumni of one of the best companies in the world. Enclosed is a copy of my NAAR Membership Application to Val Yarbrough.

With regard to the 11th Annual "Warbird Round-Up" sponsored by the Santa Maria Museum of Flight, it was decided to re-schedule the event this year after Labor Day on September 8,9 and 10th to take advantage of reduced hotel/motel rates. It was reported that participation and attendance was significantly increased, although it was disappointing to note that only two P-51 Mustangs made it this year.

I believe that the Museum will plan next year's Round-up for September as well and suggest you change your "Annual Specials" accordingly. I would also suggest that you contact G. G. "Jerry" Brown, 243 Vista Del Monte, Anaheim Hills, CA 90740 - telephone (714) 749-6591 for some super pictures of this year's Round-Up for inclusion in the next issue of the NAAR Bulletin.

With warmest regards,

E.T. "Jake" Brown
1411 Via Rosa, Santa Maria, CA 93458-8319

Andy's Note: The Bald Eagles are not our sponsors. The publication from start to finish is still the volunteer staff with a subscription covering the costs. Please be patient with us as we are learning a slew of new things we didn't have to worry about previously, such as creating a data base, printing labels and having the Treasurer in one location and the data base and our office in other locations.

Praise For The Bulletin

I received the Fall 2000 NAAR Bulletin, Thanks. We would really miss all the great work all the staff puts in to getting it out.

I am sure that a lot of us appreciative readers would gladly become a lifetime member if invited. The price is right! You might think about this for your next issue. My check would be in the mail. Really!

Now the other reason for this note; my Zip Code is *93455-4903.* It was incorrect on last mailing (93458).

Thanks again for a job well done

Sincerely,

David C. Swann
761 Pattterson Rd. Santa Maria, CA *93455*

Andy's Note: The life time membership is $100.00 ; no invitation required to be a Silver Eagle.

Keep The Bulletin Coming

Hi Val,

We are happy to see that Boeing has not killed off everything yet. We retirees are still alive and active. I retired from Downey in January 1985, with 33 years time with the Company, including the entire Navaho Program, Hound Dog, Saturn II Booster, F-15 Proposal, B-1 Bomber, and the Space Shuttle. It was all in Mechanical Design in Engineering, doing what I wanted to do when Charles Lindbergh flew the Atlantic. I feel blessed to be able to work in my chosen line of work. Keep the Bulletin coming! Prior to NAA I had worked for Douglas at Santa Monica and El Segundo, Vultee at Downey, and Lockheed, Burbank. NAA was the best of the bunch.

Doug Alkire
220 E. Hellman Ave., Monterey Park, CA 91755-1201

Andy's Note: Boeing did in fact kill off the Retiree News. The budget was not extended and the Rec. Center land where our office was located, was sold off. The Corporate Giant did not feel that they should pay this expense when their other subdivisions such as Douglas and Boeing itself did not have similar publications for their own retirees.

A Satisfied Retiree

CONGRATULATIONS! The new North American Retirees Bulletin shows much excellent planning, scheduling and plain old leg-work.

Thanks for this dedicated job for us retirees.

With many good wishes.

Bob G. Yeamans
'67 Retiree Propulsion Systems
2048-A Via Mariposa East
Laguna Hills CA 92653-2261

Retiree Meetings

Thank you for listing the information about our old Downey Retiree meetings. Now meeting at the Union Hall on the 1st & 3rd Thursdays. The meeting time is 11 AM not 10 AM as listed in the fall Bulletin.
There are a few corrections needed. The Union Hall address is 14910 Garfield Ave., in Paramount, Calif., not 1410 Garfield Ave. in Downey, CA. The President's name is Bill Kelley not Bill Kelly. You can call him for info, at 1-714-637-9374.

About your new Bald Eagles Logo – since the Boeing Company doesn't support monetary (money) for the cost of paper, printing, & mailing of the Retirees Bulletin which is now supported by subscribers. Why don't you go back to the old NAA logo with the flying eagle? It's hard to tell what the new logo is. I've enclosed some logo examples you might use.
Thanks,

Joseph May, 6049 Graywood Aye, Lakewood, CA 90712-1156. Telephone: (562)920-9002

Andy's Notes: Thanks for keeping us up to date on our typos. Our readers now have the accurate information. We were not able to show your suggested logos but we did receive them. Thanks.

Retiree News Wanted

Hi Andy
This is from Don Dodson and we just had a conversation on the phone about the Retiree News and I would like to sign up if you can tell me how.
I sure hope I can get a copy of the Fall Issue and I will get some of the other guys to sign up too. If you will send me the information. Thanks a lot and you stay healthy and I will keep in touch with you. Thanks again.

Don and Mary Jo Dodson
mdodson342@aol.com.

Andy's Note: E-Mail response to Don gave him the information. He is also passing it on to some of the guys he plays golf with.

Tri-State Attendees

Andy,
It was great to talk with you this morning. This is the e-mail I promised and would appreciate it if you would add me to your address book. If you could send me email address of retirees that might be interested in using the myfamily.com web site, please send them to me.
Thanks again for the information....

Steve Carlson,
B-1 Palmdale stvnvee@email.msn.com

Andy's Note: We do not have a listing of others e-mail addresses except the few we put in the articles. The best we can do for you is to appeal to our readers to e-mail you and the you can retrieve the address.

Napa's Pete Kreider

That headline should have appeared in the Fall edition, not Ohio's Pete Kreider. When I was going through the mail bag column and inserting headlines I looked at the address of the article just prior which was a Ohio address. Shame on me for not catching the error while proofing.

Doug Alkire Remembers Joe Cobb

Dear Editor Juif,

The Fall, 2000 issue of the "Bulletin" carried an article on Page 7, which really caught my attention. My path crossed that of Joe Cobb in mid-1927, although I never actually met him face-to-face. I have not forgotten, and have never had the opportunity to thank him. I will, do it now, with the hope that he will read about it in the "Bulletin".

Here is the story: In 1927, during summer vacation, my dad paid for a two-week stay for me at the Alhambra YMCA camp with the Indian name "Ta Ta Pochon". The camp is located at Barton Flats, in a Primitive Area, a few miles South of Big Bear Lake. I was 9 1/2 years old, and it was my first stay away from home.

At the end of the fun-filled two weeks my dad brought the rest of our family up to take me home. While visiting with the camp leaders he discovered that Joe Cobb had arrived with his mother for the next camp session. Joe immediately became sick and his mother decided that she must take him back home.

Since his stay was already paid for, and it was too late to get a replacement camper up from the city, she offered his berth to my dad. He accepted the offer, which was free, and looked me up to tell me the good news.

Joe and his mother were already gone, so I did not have a chance to thank them. I have never forgotten the generosity and want to thank Joe for his part in it. I wonder if he remembers the incident?

I was never a movie actor except in my own home movies but I did serve as a sort of "Stand-in" for Joe for two weeks. He worked at North American for 30 years, and I worked for North American for over 33 years. so we did have some years overlapping where we were both at NAA for 21 years.
Keep up your excellent work, Michel, it is really appreciated.

Douglas Alkire,
220 East Hellman Ave., Monterey Park CA. 91755-1201

P.S. John Markel and I worked in the same group in Airframe Design in the early 50's. Several years ago I wrote to him at your office, but received no response. John, I have not forgotten you.



HERBERT ZIEGLER (ZEKE) HOPKINS was born on March 25, 1926. He passed away in September 28, 2000. He graduated into the Army Air Corps as a pilot from the USMA at West Point in 1946. In 1949, he received a Masters Degree in Aeronautical Engineering from Princeton University. He served as a Flight Test Engineer at Wright Field for two years, and was sent to Edwards AFB to attend the USAF Test Pilot School. In 1955, he accepted a position as a North American Aviation Engineering Test Pilot flying prototypes of the F-100 and A3J. Zeke was promoted, in 1962, as Chief of the XB-70 Flight Operations. He left North American Aviation in 1966 to accept the position of Director of Operation for Filper Research. Finally he joined McDonnell Douglas in 1968 as a Project Engineer and Program Manager on the DC-10 and T45-TS. He retired in 1991

BAKER, LUCY - died in Torrance, CA on September 26, 2000. Lucy retired after working 31 years in Plastics. Ken Fowler, who learned of her death from the obituary in the Daily Breeze, notified us.

CARPENTER, ALAN B., - 82 of Yorba Linda, CA an industrial engineer, died on September 30, 2000 of cancer. Al worked in Industrial Engineering at Autonetics and Space Division. Maxine Haun notified us.

CREACH, JESS, 84 1/2, passed away on November 12, 2000 in Torrance Memorial Hospital. JESS retired from LAD where he was a design checker in Tool Design on the B-1 program. Reported by Dumont Wing, a good friend.

HARCOURT, FRED, 70 - of Brea, CA died February 18, 2000 of complication from diabetes. Fred worked at Rockwell International as a Material Contract Manager. Information obtained from an obituary

KELLEY, LEON E., 65 - of Redondo Beach, CA passed away on September 25, 2000. He retired from North American Aviation after 39 years. Information from an obituary in the Daily Breeze.

LEWIS, GEORGE, 84 - passed away September 22, 2000 of heart and kidney failure. George was hired in 1936, he worked in Tooling Division at LAD and served as Tooling Superintendent for many years. Ted Ryan and George Wiley notified us.

NETHERTON, BILL –long time tooling employee, passed away on August 23, 2000 after a long struggle with emphysema. Bill worked fro the company from 1951 to retirement in 1982. He worked on many programs, the latest being the Apollo and the B-1. Rex Tabor notified us.

PORTER, JANICE - passed away in August. Janice worked in Production Planning and Production Control for more than 35 years. Her family notified us

REED, DAVID ARTHUR JR. , born in October 19, 1919, passed away on October 8, 2000 of natural causes. He worked in Engineering at North American Aviation. He retired from North American Rockwell in 1982. Information obtained from an obituary sent by Maxine Haun.

RIDHEART, WILLIAM H. "Bill" - passed away at his home in Lancaster, CA on June 10, 2000. Bill worked for North American Rockwell for 39 years. He started at the Columbus Division as an Aeronautical Engineer, he then transferred to LAD. He also worked at Edward AFB. He retired in 1982 as an Instrumentation Engineer. Joe M. Ozment, a retired Engineer from Palmdale, who now reside in Selmer, TN notified us of Bill's death.

ST. CLARE, C. KENDRICK , 79 - of Fullerton, CA, a supervisor for Rockwell International, died on September 20, 2000 of cancer. Information obtained from an obituary in an Orange County newspaper.

SUTTON, REX STANLEY, 81 - died at Western Medical Center in Irvine, CA on September 30, 2000. Rex worked at LAD in design and management positions in Engineering on many programs including the B-1 and the Sabreliner. Information obtained from an obituary in an Orange County newspaper.

THOMAS, HANNAH MAE, the mother of **VAL YARBROUGH**, RB Treasurer and Chairperson of the Bald Eagles, passed away at the age of 99 on November 2, 2000 of natural causes. Hannah was born on August 21, 1901 in Rocky Ford, CO. On behalf of the Bulletin Staff and the Bald Eagles directors we extend our sympathy to Val for the loss of her loved one.

THE BALD EAGLES, INC. PAGE

BALD EAGLES ANNUAL REUNION

THE 39th ANNUAL BALD EAGLES REUNION WILL BE HELD ON SATURDAY, APRIL 21, 2001, AT THE PROUD BIRD RESTAURANT, 11022 AVIATION BLVD. (AT 111TH STREET). DOORS OPEN AT 10:00 AM FOR VISITING. SEATING FOR LUNCH AT 12:00 NOON.

IF YOU PLAN TO ATTEND, SEND A CHECK PAYABLE TO BALD EAGLES, INC. FOR $20.00 FOR **EACH MEMBER IN YOUR PARTY** TO:

VAL YARBROUGH
520 DEL ORO DRIVE
OJAI, CA 93023-1805
TEL: (805) 646.2283

INCLUDE WITH YOUR CHECK THE NAME(S) AS THEY SHOULD APPEAR ON THE BADGES FOR EACH PERSON FOR WHOM YOU ARE ORDERING TICKETS.

TICKETS AND NAME BADGES WILL BE HELD AT THE ENTRANCE.
THE BALD EAGLES REUNION AREA WILL BE CLEARLY MARKED.

SORRY, THERE CAN BE NO REFUNDS AFTER APRIL 2, 2001.

THIS IS THE ONLY NOTICE YOU WILL RECEIVE ABOUT THE EVENT. SHARE THIS NEWS WITH OTHERS WHO HAVE AN INTEREST IN NORTH AMERICAN AVIATION/ROCKWELL, ITS HISTORY, AND ITS EXTRAORDINARY HERITAGE OF PRODUCTS AND PEOPLE. THERE IS NO MINIMUM COMPANY SERVICE REQUIREMENT FOR ATTENDANCE - - JUST $20.00 AND AN INTEREST IN THE COMPANY AND ITS PEOPLE. WHAT A GREAT TIME TO SEE OLD (AND NOT SO OLD) FRIENDS!

SEE YOU THERE.

Farewell
20th Century

WE THE WILLING LED BY THE UNKNOWING
ARE DOING THE IMPOSSIBLE
FOR THE UNGRATEFUL.
WE HAVE DONE SO MUCH FOR SO LONG
WITH SO LITTLE
WE ARE QUALIFIED TO DO
ANYTHING WITH NOTHING.
The Retiree News Staff

Hello
21st Century

As we are closing the 20th century, the above verse summarizes our endeavor, over the past decades, that we so diligently and faithfully devoted to the Retirees of NAA and Rockwell. ***Happy New Year everyone!***

Retirees Bulletin Office
2600 Westminster Blvd.
PO Box 3644, M/C SJ 51
Seal Beach, CA 90740-7644

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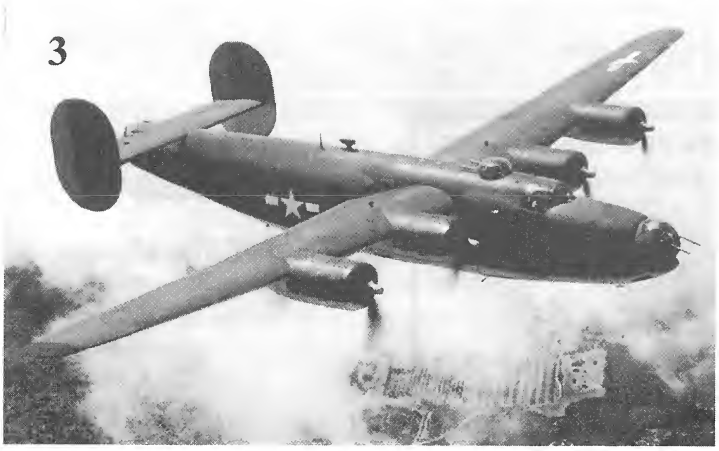
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Answers can be found, somewhere, inside this issue.

A Bald Eagles Inc. Publication

North American Aviation Retirees

Bulletin

NAA RETIREES

WINTER 2000

Season's Greetings

Inside:
Viewing a Shuttle Launch (STS-92/Discovery) - By Ed Rusinek
A Son Remembers His Father, Edgar Schmued—By Rolf Schmued



The Space Shuttle (STS-92/Discovery) Crew

From Left to Right

Standing: Astronauts Leroy Chiao, Michael Lopez-Alegria, William McArthur Jr., Jeff Wisoff, and Koichi Wakata

Sitting in Front: Pilot Pamela Melroy and Commander Brian Duffy

North American Aviation Retirees

Bulletin

DEAR NAA RETIREE NEWS READER:

Hooray! Hooray! We are back! Thanks to some generous contributions we have enough "seed money" to start publishing the new NAA RETIREES BULLETIN on a limited scale. As you know, Boeing has withdrawn all financial support, so we have to ask you to subscribe if you wish to receive our publication.

Since most of you are not aware of our return, we are taking a big chance and sending this issue to all our previous 8300 free subscribers with the hope that they will send us the $10.00 fee. The ten bucks will buy you the next four quarterly issues plus a membership in the Bald Eagles, Inc., regardless of the length of employment you had with the company. If we don't hear from you, we will assume that you are not interested and this issue will be our final communication.

Why not take a few minutes and fill out the little membership form on this page and send it along with your check. If you like to be sure someone else should also receives this publication, double the amount of your check. And give us their name and address. We will drop them a post card, telling them of your generosity! Please make all checks payable to Bald Eagles, Inc.

Use of the form below is not mandatory, it is only a convenient way of subscribing. If you want to preserve your issue and not cut out the form, you may just write us a note and give us the same information that are on the form. If you wish, affix one of your return address label in lieu of writing your address by hand

If you have already sent us the $10.00, you are paid up through the four issues for 2001. This will simplify our bookkeeping if everyone comes due at the same time. If you have sent $20.00 you are paid up through 2002. If you sent $100.00, you have bought yourself a lifetime membership! Your name will be added to the Silver Eagles. Whatever you sent, God Bless!

The above information supersedes the statement made in the Editor's Corner (Fall 2000 issue), in reference to the annual fee lapsing after the Spring issue.

Motions were made at the BOD meeting on all above pertinent matters and were approved unanimously, including the elimination of the 25 years requirement for Bald Eagles membership. All Retiree Bulletin readers are also Bald Eagles members.

MEMBERSHIP FORM

RETIREES BULLETIN OFFICE
PO Box 3644, M/C SJ51
Seal Beach, CA 90740-7644

Yes, I am a retiree of NAA/Rockwell and I want to be a member and receive the NAA Retirees Bulletin. I am enclosing a check payable to the Bald Eagles, Inc. for $ _____
For every $10.00 I will receive four issues.

Name _____
Street Address _____
City/State/Zip _____

I retired from_____ Division
After _____ Years of Service

GIFT SUBSCRIPTION

Also, please send a gift subscription to:

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I am enclosing payment and I understand you will be send a gift card to recipient.

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NAAR is an affiliate of the **Bald Eagles, Inc.** and is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAAR office is located at Boeing, Seal Beach facility. Send mail to:
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"To grumble is Human. Men Grumble because they are served turkey in place of goose, or vice-versa. Grumbling is as necessary to most men as fleas are to dogs. A reasonable amount is good for both of them, as it keeps them interested in life. It is the almost invariable rule that men who grumble mean nothing by it. Too much grumbling, however, will get any man in wrong in time and it is best to limit this art to whatever is necessary for the man's pleasure in life."
U.S. Navy Blue Jackets Manual, 1940 edition

NAA/ ROCKWELL/BOEING RETIREE CLUBS and GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Bill Kelley (714) 637-9374

TheAntelope Valley Retiree Club meets at 10:00 AM every 2nd and 4th Monday of the month at the Palmdale Fitness Center. All North American retirees are welcome. For more information call (805) 265-3488.

The Boeing Valley Retiree's Club meets on the 3rd Thursday of each month at the Canoga Park Rec. Center. 8500 Fallbrook Ave. Canoga Park, CA. President: Jennie Muncaster (818) 341-8919

Autonetics Retirees meets for lunch at 11:45 AM on the 2nd Wednesday of each month at the Rembrandt Restaurant, 909 E. Yorba Linda Blvd., Placentia CA. All Autonetics retirees, spouses and friends are invited.

"Ye Olde Pharts Breakfast Club" meets for breakfast every 4th Thursday of each month at Coco's in Orange.

A group of NAA Retirees meets for breakfast on the 1st Wednesday of each month at the Knott's Berry Chicken Farm Restaurant at 8:15 AM. All are invited.

"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meets for lunch on the 2nd Wednesday at 11:30 AM at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd & Mariposa Ave.

"The Old LAD Stress Group" meets approximately every two months at Mimi's Café in Torrance, CA for breakfast. If you were in the old LAD Stress Group and want to join them, contact Gene Laxton (310) 378-3113 or Ed Rosenthal (310) 375-8933

The Downey Engineering Group of Retirees known as "The Choir Boys" meets every Thursday for lunch at various restaurants from Seal Beach to Downey. Call Al Risi at (714) 892-5725 for meeting location.

GPS Breakfast Club meets every Wednesday morning from 6:00 to 8:00 AM at the Primrose Restaurant at the corner of Seal Beach Blvd and Westminster Blvd. All are invited, retired or not.

The Facilities, Industrial Engineering and Plant Services Retiree Group meets on the second Thursday each month at the Jolly Roger in the Long Beach Marina at 11:45 AM. Friends and wives, former and current employees are welcome.

The North American Rockwell Retirees Club of McAlester Oklahoma (a satellite of Tulsa, OK) meets each month on the 3rd Tuesday, 10:30 AM at the Down Town Meeting Place. For more Information contact:

J. A. Darden, 343 W. Adams Ave. McAlester, OK 74501 or phone (918) 423-0706.

Tulsa & McAlester Retirees meet for breakfast at 8 AM on the second monday of March, June, September & December at the Harvest Buffet, 3637 S. Nemovial Drive, Tulsa. Call Harry Phillips for more detail call (918) 838-3716.

The North American Rockwell Retiree Group of Columbus, OH. Engineers and Professionals meet each month on the 3rd Thursday at 11:30 AM at the Berwick Park House. For more info. contact Byron C. Solomides (614) 486-3239.

NAA/Rockwell U.A.W. Group of Columbus, OH, meets on the 1st Monday of each month at Noon at the Old Rockwell Park (North Hamilton Rd.) E. Hamilton (740) 927-5940.

Autonetics Group that includes Marine Systems, Program Office, Project Office, System Test, Engineers, Designers, etc. meets for lunch on the last Wednesday of each month at the Hometown Buffet, Rose Avenue and Alta Vista Drive in Placentia. For more information call Mike Vohs (714) 762-1925.

A group of NAA Retirees from 101 Tooling meets for breakfast at 10:00 AM on the first and third Thursday of each month at the Cimarron Café at 5160 190th St., West of Anza Avemue in Torrance.

Annual Specials

The "Warbird Round-Up", sponsored by the Santa Maria Museum of Flight - August, 2001

Bald Eagles Reunion - The 39th Annual Reunion is on April 21, 2001

Grants Pass Picnic - 1st Wednesday after Labor Day, September 5, 2001

Tri-State NAA / Rockwell Reunion - Usually meet in October at the Elks Lodge, Bullhead City, AZ. Call Diane Millard (520) 758-1554, Bill Eng (520) 758-5685 or Roy Elwell (520) 754-3175 for information.

NAA-K B-25 Reunion is held yearly at the Wyandotte County Museum. For more information call Harry J. Desko (913) 287-7223 or write to him at 3024 N. 47th St., Kansas City, KS 66104.

Flying Horsemen For year 2001 ROWDY-O contact Bob Morse's home in Grants Pass. Phone: (541) 474-1438, or by mail to PO Box 415, Murphy, OR 97533.

The Hangar Gang - This group of retirees meets approximately every 6 months. For time and date or additional information call Gene Salvay (818) 788-3974, or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.

Annual Flight Test Instrumentation Reunion - This group of retirees meet annually at the Fullerton Elk Club. For Information call Ed Mosbrook (714) 531-8060 or Frank Vigil (562) 691-0236.

If your group of retirees is not included in the CALENDAR OF EVENTS, please notify us either by writing to the Retirees Bulletin Office at our Seal Beach address, or by calling (562) 797-3836. Be sure to give us the name of your group and/or a nickname, if you have one. Use the "Who, What, When, Where" format as in the examples above. A person to contact for information and a telephone number would also be very useful.

Another Recreation and Fitness Facility Bites the Dust.

Boeing's facility (formerly Autonetics) in Anaheim is closed forever .

The center was built by North American Aviation in 1962 and Rockwell International ran it for 30 years.

Not only, was it a great place for employees and retirees to keep in physical shape, but it had many other activities and clubs.

There were company picnics and retirees luncheons. It also hosted the Ceramic Club, the Radio Club, the Photography Club, the Mineral Club and even a Gun Club.

Other groups also held their meeting there, such as the Masonic Aerospace Club and Ham Operators.

Cynthia Kroll, a UC Berkeley economist who has studied the aerospace industry said, "There was a different view of corporate life then. In many ways, the company provided a whole setting for a person's life, not just a paycheck."

Boeing, which took over local operations from Rockwell in 1996 has sold the 20-acre property on Mira Loma Avenue to another undisclosed business.

To date the bulldozers have begun to leave their marks and are in the process of demolishing the buildings and clearing the land. Viewing the site is very depressing and has angered many employees and retirees, some of whom made their feelings known by e-mail missives to higher-ups.

Boeing officials declined to name the buyer or the price, pending escrow, but sources said the buyer is in the surf-wear business.

A similar, but smaller, Fitness Center will open soon in Huntington Beach for Boeing employees

Send us mail for the Mail Bag—Andy Tindley is waiting for your letters. Also don't forget that you can put ads in the Mail Bag if you have something that you want to sell or that you want to buy (No charge for this service, OK!).

MISCELLANEOUS INFORMATION

All NAA / Rockwell / Boeing Retirees that have a need to contact the BNA Benefits Center must have their Personal Identification Number (PIN) available before attempting a call to the Center.

The telephone Number is 1-800-438-3116. The business hours are from 10 AM to 6 PM (EST) M through F.

If you don't have one or forgot your PIN, you must write to the Center:

BNA BENEFITS CENTER
PO Box 24567
Jacksonville, FL 32241-4567.

Services provided by the Center are:

Life events, enrollment or change in medical/dental plans, address changes, plan comparisons of medical benefits, answers to general health/dental/vision and life questions, health care/Life Insurance direct billing procedures and confirmation statements.

The above information does not apply to retirees from the Rockwell Corporate Offices. These former employees remain under the Rockwell Corporation benefits and pension plans

Other Services Available to Retirees

Only the Boeing California Employee Fitness, Inc. location at Seal Beach is available to Retirees. To access the facility, retirees must exchange their Retiree Card for a temporary badge at Gate 510 on Westminster Blvd.

Discount tickets to recreation parks are no longer available at the Fitness Center. However, there are a couple sources still available.

Employee Services discount tickets:

1.) www.Boeing.esvp.com/, if you have internet: call 1-877-641-7283

2.) Through employee EASI discount ticket program: call 1-888-608-2911

Disneyland and other parks accept AAA and AARP memberships for discounts.

Retirees on tours wishing to rent a car can benefit from the Boeing Corporate Discount.. The company negotiated contract agreements are:

No. 5555501 for National and No. 147616 for Alamo.

Refer to the pertinent number when negotiating a rate for car rental at National or Alamo. Have your retiree ID card with you all the time

NEW OFF THE PRESS

THE NORTH AMERICAN P-51 MUSTANG
BY LARRY DAVIS

A photo chronicle. Begins with Mustang production in early 1941 initiated by the British order for 320 aircraft with Mustang 1, RAF s/n AG345 rolling off the assembly line on April 1941. The latest P-51D, considered the ultimate Mustang, the lightweight P-51H and twin Mustang F-82 are also covered.

SCHIFFER PUBLISHING.
112 pp, ISBN: 0-88740-411-1, PAPERBACK, $19.95

Look at back cover before peeking at text below.

WWII aircraft on the Back Cover: 1 - B-17 Flying Fortress (Boeing); 2 - B-26 Marauder (Martin); 3 - B-24 Liberator (Consolidated); 4 - B-32 Dominator (Convair). How many did you identify correctly?

BY ED RUSINEK,
Staff Reporter

VIEW A SHUTTLE LAUNCH (STS-92/DISCOVERY)

Although, it has been twenty years since my last visit to the Kennedy Space Center and over 30 years since I was assigned here as the Reliability Project Engineer for SC009, the first unmanned Apollo, and Apollo 7, the first manned vehicle after the Apollo I fire; this was not a sentimental journey for me into the past. The purpose of my visit was to finally see a Space Shuttle launch!

Arriving at T-2 Days, I drove down the Beeline Expressway from Orlando to Cocoa Beach and was almost swamped by a fast moving squall. The rain persisted and the prognosis for a launch on time was very gloomy. The Cocoa Beach / Cape Canaveral area remains the same as I remember it in many ways yet different in others.

Probably two of the most popular Cocoa Beach restaurants in the old Apollo days, Alma's and Bernard's Surf, are still in business. However, the restaurant on top of the new bank building is long gone and the building itself looks decrepit. The Polaris Motel with its notorious Mouse Trap bar has been demolished and replaced by a huge restaurant. I wonder if they got rid of the hordes of palmetto bugs (cockroaches) at the same time when they tore the buildings down.

Cape Canaveral has also experienced change. Evidently, the once vaunted museum displaying salvaged Spanish gold coins has been opted into a huge sex shop. I did not venture to go inside so I cannot discuss its attributes! The Fat Boy BBQ, so often mentioned by Walter Cronkite during his Apollo launch visits, is still here but of little greasy consequences. Port Canaveral is expanding its facilities to accommodate the lucrative cruise lines but one of the lines has already gone under (only financially!).

As your credentialed member of the Press, I went on a T- 1 Day orientation tour of KSC, which allowed me the opportunity to observe the changes that have been incorporated since I was part of the launch team. First stop was the Vertical Assembly Building (VAR). Although four of the huge bays were used to prepare the complete Saturn/ Apollo vehicles, only two of the bays are now being used to stack the Space Shuttle with a third kept available as a haven in case of a rollback because of hurricane dangers at the pad.

Just northwest of the VAB is the Shuttle Landing Facility with its 15,000 ft long x 300 ft wide runway with 1,000 ft extensions at each end. From there, the orbiter is moved on the towway to the Orbiter Processing Facility (OPF) almost adjacent to the VAB. Entering the OPF, we did a walkaround ATLANTIS that had landed at KSC two weeks earlier and was being prepared for its next mission. The vehicle had been jacked up off its wheels and extensive tile replacement and repair had been completed. Interestingly, the orbiter thermal tiles being used to replace damaged tiles are all being custom made here on location within this small industrial complex.

The three Space Shuttle Main Engines (SSME's) had been removed from ATLANTIS and sent to the SSME OPF next door. We were offered the opportunity to visit that facility and were given a short tour by one of the accommodating technicians. As we were leaving, I asked him his company affiliation. He answered, "Oh! I'm Boeing Rocketdyne. Are you familiar with my company?" I responded, "I knew your company when it was only the Propulsion Group in Downey, California and all the engineers had pieces of German V-2 rockets strewn all over their desks!"

A visit to Launch Pad 39A was somewhat dampened by another short cloudburst, so taking good pictures of the Space Shuttle on the pad was somewhat dubious. Some of the Press had cameras worth tens of thousands of dollars and they toweled them down with growing anxiety. I had no such problems with my $ 69.00 Nikon!

As our tour bus drove around the launch pad, I noticed a group of people setting up what looked like rural mailboxes or small dog houses on top of posts on any slight rises next to the road, all pointed at the stack. I asked one of the media people what they were doing and he informed me that they were commercial photographers setting up their cameras in these little shelters from the rain. Since we were so close to the pad it was obvious that the people could not be present at time of lift-off. The cameras are triggered to shoot by acoustic devices, which initiate the action when the SRBs ignite with a roar. The cameras track the vehicle for only a few seconds after it leaves the pad. Incidentally, if this method results in one or two excellent still shots, the photographer is very happy with the results.

The next stop on the tour was at a relatively new building (located just east of the Operations and Checkout Building), called Space Station Processing Facility. In this building, modules destined for the International Space Station are brought in for a final checkout before loading into the delivery Shuttle. I noticed that the Canadian arm designed for use on the ISS is a telescoping design, compact and much shorter than the Shuttle arm when stored. Some of the ISS trusses are too large for this facility and are housed in the 0 & C Building.

Launch Day started with a bright cloudless morning. It looked like a great day for a launch! About 1:00 PM in the afternoon, the Press Site received the disheartening announcement. Examination of photo evidence from the previous mission indicated that the Aft Right Attach Bolt between the ET and Orbiter did not retract properly and "almost 3 in. remained protruding". The mission was scrubbed until the following night. The next morning it was announced that the Pogo Accumulator Recirculation Valve, which must open at T-12 Seconds, did not cycle properly and would have to be replaced. This would take an additional three days. In this timeframe another hardware issue was found and cleared but then the weather closed in and caused another one-day slip. Finally, six days after the original scheduled date, DISCOVERY appeared ready to go.

It was a perfect liftoff as DISCOVERY began its eleven-day journey to rendezvous and dock with the ISS. DISCOVERY will deliver two major segments of the ISS, an exterior framework called the Zenith (Z-l) truss and a third mating adapter. These units will be attached to the ISS using the Shuttle robotic arm

Coming here was a sentimental journey after all.

About the Shuttle

The 28th flight of the Space Shuttle DISCOVERY, that occurred on October 12th, 2000, marks the 100th mission launched from Kennedy Space Center. STS-92 (also designated as International Space Station Flight 3A) will continue the preparation of the ISS for its resident crew. Out of 100th flights designed for each orbiter, DISCOVERY will be the most-flown Shuttle after completion of the STS-92 mission. DISCOVERY'S primary payload, the Zenith (Z-1) Truss, is the cornerstone truss for the ISS. This component carries many critical items for the Station's attitude, communicators, thermal, and power control systems.

BY ROLF SCHMUED

A SON REMEMBERS HIS FATHER, EDGAR SCHMUED

My father's story is the fulfillment of the American Dream where a young immigrant with ambition and perseverance rises to the top of his profession.

Edgar Schmued was born on December 30, 1899 in Hornbach, Germany of Austrian parents. His father was a dentist. Edgar, the eldest, had two brothers and three sisters. He was not a distinguished scholar but he was fascinated by the technology of the day, which involved aeronautics. He read and studied anything he could find pertinent to aviation.

Toward the end of World War I, he was old enough to enter the Austrian military service and fortunate enough to be assigned to a ground support unit within the air service. The war soon ended but the interest in aviation remained. He found work in a machine shop, which gave him some practical experience. He designed a small sports plane but it led to a dead end because Germany was not allowed to build aircraft.

Edgar met and married Luise Heyne and in 1921 had a son, Rolf. With these added responsibilities, he sought to come to America. However, the immigration quotas made it very difficult to enter the United States. Therefore, in 1924, Edgar decided to immigrate to Brazil where entry was much easier. Luise and Rolf would follow when he became established in Brazil.

He was hired by General Motors of Brazil as a supervisor of dealer service facilities, which involved extensive travel throughout Brazil. This gave him greater knowledge of mechanical systems and how to work with people. But it was only a step in his wish to come to America and become an aircraft designer.

In 1930, Edgar received his visa to come to the United States. He found work at Fokker Aircraft in Hasbrouk Heights, New Jersey. His first assignment was to design a hinge. Other assignments and responsibilities followed.

However, what happened next was totally unexpected. Through a series of mergers and acquisitions, Fokker became Berliner-Joyce, than General Aviation and, finally, North American Aviation, Inc. By this time, Edgar had advanced to the position of project engineer for the YO-47, a three-man observation plane for the U. S. Army Air Corps.

In 1933 he felt secure enough to send for Luise and Rolf. This was the first time the family was together since he left Germany except for a one-year



Luise and Ed with their son, Rolf, on the left

stay in Brazil. There the family was torn apart when an adjacent building collapsed and Luise sustained major injuries. She and Rolf returned to Germany for extensive medical treatment.

Dutch Kindelberger became president of NAA and in 1935 decided to move the company to California. Luise, yearning for some sort of stability in her family, persuaded Edgar to remain on the East Coast. He went to work for Bellanca Aircraft but after only a month he decided to rejoin the NAA team in California. Unfortunately, that decision led to tragedy!

In Indio, less than two hours away from their destination there was a head-on car crash. Luise died at the scene and Edgar had multiple leg fractures as well as many lacerations on his face. He almost lost an eye. He was in the hospital for six months and another six months on crutches.

It was here that his NAA family closed ranks. The Richard Thaiss family took Rolf in while Edgar remained in the hospital. Almost every weekend, one of Edgar's NAA associates would take Rolf and drive up to visit him in Indio. Once he was out of the hospital, Chan King faithfully drove Edgar to and from work in his 1930 Ford roadster with the right door open and Edgar's leg out on the running board to allow for the huge cast on his leg. Rolf remains touched to this day by the compassion and care shown him and his father by so many wonderful people!

Edgar had a very difficult time dealing with Luise's death. It was not only the feeling of loss after all the years of separation but also the feeling of guilt, although the accident was clearly not his fault. His salvation was his work. He immersed himself in all the latest scientific studies and breakthroughs. It was during this period he defined his concepts for military aircraft. In 1936, Dutch Kindelberger promoted Edgar to Chief of Preliminary Design. They were both visionaries and they made a great team with Dutch on the selling end and Edgar on the design end.

In 1940, with World War II exploding, they were ready and the Mustang P-51 was born. Readers of the NAA Retiree News are familiar with the P-51 and its role in helping win the air war of World War II. However, the success of the plane would not have been possible without the leadership of these two men and the spirit of camaraderie and cooperation exemplified by such men as Dick Schleicher, Ed Horkey, John Young, Larry Waite and so many others, too many to mention, from test pilots to sheet metal workers. These men virtually lived the project day and night to get the first airplane designed and built in the legendary 100 days!

As Chief of Preliminary Design, Edgar, of course, was involved in the design of other NAA aircraft but it is the Mustang for which he is best remembered. When the war ended it was necessary to adjust and scale down to a peacetime economy. The pace and the pressure were gone and with them, the thrill!

In 1952, Edgar left NAA and accepted the position of Vice President of Engineering with the Northrop Corporation. There he played a significant role in the development of the T-38 trainer and F-5 fighter aircraft. In 1957, he was appointed to the Northrop Executive Committee where he felt too isolated from his first love, engineering. He resigned from Northrop.

He decided to go out on his own and, over the following years, was involved in a variety of ventures and consulting projects. These included a "throwaway aircraft" to carry individual soldiers over a battlefield and a method of reducing emissions from an automotive combustion engine. At 79, he went to Taiwan to teach young Taiwanese engineers how to design and build automobile engines. However, his health started to falter and he eventually moved to Oceanside, California where he was welcomed as an aviation pioneer.

Although not as well known today as he was during his active years, the technical community always recognized

ED SCHMUED/ Page 7

ED SCHMUED, continued from page 6

his contributions. Having served on the USAF Scientific Advisory Board, he was presented the Exceptional Service Award in 1962. He was also appointed a Fellow and, later, a Vice President of the Institute of Aeronautical Science, a Fellow of the Institute of Aeronautics and Astronautics as well as a Member of the National Advisory Committee for Aeronautics.

Edgar Schmued said he did not want to live if he could not work at his profession. On June 1, 1985, he died while in the midst of negotiations with Ryan Aircraft to perform some consulting work. He had lived a very productive life and had won the respect of his family, his associates and the pilots that flew his planes. In 1991, Edgar Schmued was invested in the International Hall of Fame at the Aerospace Museum in San Diego.

Editor's Note:
Ed Schmued in his early days at North American Aviation in the cockpit of an airplane on the right. Lest we forget, Ed was also the creator of the well known NAA logo, the famous flying bald eagle inside a triangle



THE P-51 MUSTANG WAR DIARY

January 11, 1944 – Mustangs were revealed for the first time by the Army Air Force as being in use as long-range fighter escorts for heavy bombers; although the P-5l Bs had been used as "top cover" for the bombers since December 1, 1943. The Mustangs flew with the heavies, estimated at close to 1,000, on a raid that virtually obliterated three German fighter plane assembly plants on the outskirts of Berlin. During the attacks on Oserschleben, Halberstadt and Brunswick, Mustang pilots shot down 15 enemy planes and damaged many more of the estimated 100 Nazi fighters that attempted to intercept the bomber formations.

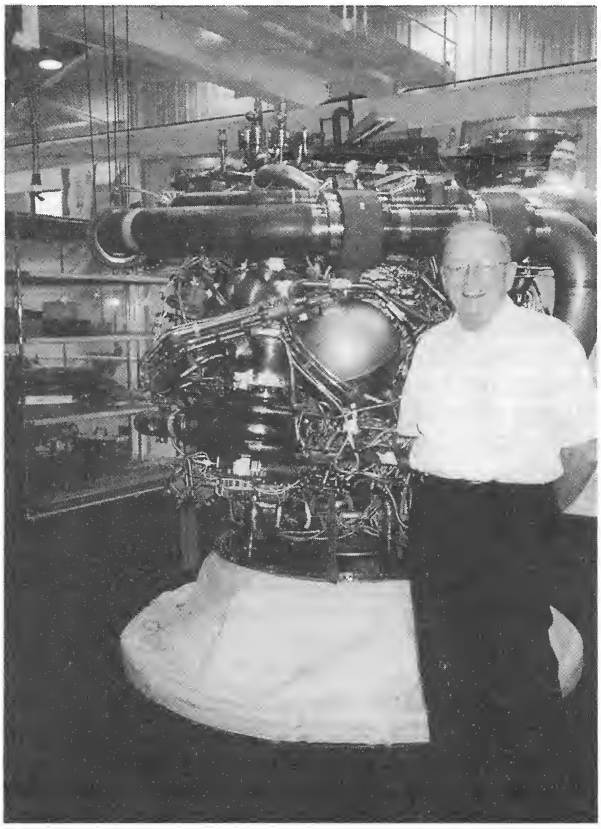
The Mustangs, led by Major James Howard, made the deepest penetration into Germany of any Allied fighters, flying more than 400 miles into the heart of the Reich. En route home, Major Howard distinguished himself by single-handedly protecting an entire combat wing of bombers from attacks by 30 Nazi planes. Separated from his unit, Major Howard dived and climbed and twisted in his Mustang through vertical miles of sky, firing at members of the Luftwaffe trying to reach the bombers.

When all of his guns but one had ceased firing, he bluffed the German pilots into breaking off their attacks, continuing his lone "flying circus" for a half hour precious time for the bombers. During his 30-to-1 battle, before he dove out of sight on the tail of a Nazi, Major Howard claimed two enemy planes destroyed, two probably downed and one damaged.

From "The P-51 Mustang War Diary" published by NAA in 1944.

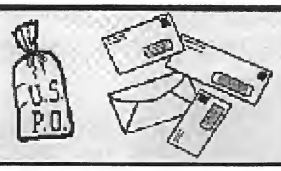
Doolittle's B-25s Over California!

Four North American Aviation B-25 Mitchell bombers were spotted last July on the Chino Airport ramp in Southern California .
They will be featured in the final moments of the forthcoming Disney movie "PEARL HARBOR". They will be used to recreate the famous Doolittle raid flown on April 18,1942.
Although the insignias and the bogus tail serial numbers correctly represent the B-25B block used by the Doolittle raiders, the planes are actually from the late 1944 B-25J series with a forward mounted dorsal turret plus waist and tail guns locations



ED RUSINEK at the Kennedy Space Center, FL
Seen here with one of the three Space Shuttle Main Engines removed from ATLANTIS for servicing at the Orbiter Processing Facility

THE MAIL BAG



By Andy Tindley (310) 325-6770

E-Mail: AndyOber@Juno.com

I Found It!

While picking up a prescription at the Fullerton Prescription center I found a fall issue of the North American Retirees Bulletin. I was delighted to find that you had picked up the publication as a function of The Bald Eagles.

I don't know that I am eligible to be a Bald Eagle, but I am anxious to be on the mailing list for the retiree news. While at the aircraft division in El Segundo I was in Human Factors doing escape system test work for the F-100, F-107, X-15, and the B-70. At the Space Division in Downey I was in Life Sciences doing test work on the crew equipment. I then returned to El Segundo, doing escapes systems and crew equipment testing. I retired in 1985 with twenty-six years or service.

I have missed the Retiree News. Thank you and your staff for making it available again.

Many Thanks,

Glenn Patton 1917 N. Lyon St.. Santa Ana CA. 92705
Tel: (714) 543-5762, glennpatton@msn.com

Andy's Note: Word of mouth is our only way to inform retirees about the revival of the Bulletin. Keep passing the word. Our Editor and staff wish we could have notified all prior subscribers, but it wasn't to be because of the way we went out of print with the Retiree News.

Warbird Round-up

I was very pleased to receive the Fall 2000 issue of the North American Aviation Retirees Bulletin and learn that the Bald Eagles, Inc. has picked up the ball in maintaining contact with alumni of one of the best companies in the world. Enclosed is a copy of my NAAR Membership Application to Val Yarbrough.

With regard to the 11th Annual "Warbird Round-Up" sponsored by the Santa Maria Museum of Flight, it was decided to re-schedule the event this year after Labor Day on September 8,9 and 10th to take advantage of reduced hotel/motel rates. It was reported that participation and attendance was significantly increased, although it was disappointing to note that only two P-51 Mustangs made it this year.

I believe that the Museum will plan next year's Round-up for September as well and suggest you change your "Annual Specials" accordingly. I would also suggest that you contact G. G. "Jerry" Brown, 243 Vista Del Monte, Anaheim Hills, CA 90740 - telephone (714) 749-6591 for some super pictures of this year's Round-Up for inclusion in the next issue of the NAAR Bulletin.

With warmest regards,

E.T. "Jake" Brown
1411 Via Rosa, Santa Maria, CA 93458-8319

Andy's Note: The Bald Eagles are not our sponsors. The publication from start to finish is still the volunteer staff with a subscription covering the costs. Please be patient with us as we are learning a slew of new things we didn't have to worry about previously, such as creating a data base, printing labels and having the Treasurer in one location and the data base and our office in other locations.

Praise For The Bulletin

I received the Fall 2000 NAAR Bulletin, Thanks. We would really miss all the great work all the staff puts in to getting it out.

I am sure that a lot of us appreciative readers would gladly become a lifetime member if invited. The price is right! You might think about this for your next issue. My check would be in the mail. Really!

Now the other reason for this note; my Zip Code is *93455-4903.* It was incorrect on last mailing (93458).

Thanks again for a job well done

Sincerely,

David C. Swann
761 Pattterson Rd. Santa Maria, CA *93455*

Andy's Note: The life time membership is $100.00 ; no invitation required to be a Silver Eagle.

Keep The Bulletin Coming

Hi Val,

We are happy to see that Boeing has not killed off everything yet. We retirees are still alive and active. I retired from Downey in January 1985, with 33 years time with the Company, including the entire Navaho Program, Hound Dog, Saturn II Booster, F-15 Proposal, B-1 Bomber, and the Space Shuttle. It was all in Mechanical Design in Engineering, doing what I wanted to do when Charles Lindbergh flew the Atlantic. I feel blessed to be able to work in my chosen line of work. Keep the Bulletin coming! Prior to NAA I had worked for Douglas at Santa Monica and El Segundo, Vultee at Downey, and Lockheed, Burbank. NAA was the best of the bunch.

Doug Alkire
220 E. Hellman Ave., Monterey Park, CA 91755-1201

Andy's Note: Boeing did in fact kill off the Retiree News. The budget was not extended and the Rec. Center land where our office was located, was sold off. The Corporate Giant did not feel that they should pay this expense when their other subdivisions such as Douglas and Boeing itself did not have similar publications for their own retirees.

A Satisfied Retiree

CONGRATULATIONS! The new North American Retirees Bulletin shows much excellent planning, scheduling and plain old leg-work.

Thanks for this dedicated job for us retirees.

With many good wishes.

Bob G. Yeamans
'67 Retiree Propulsion Systems
2048-A Via Mariposa East
Laguna Hills CA 92653-2261

Retiree Meetings

Thank you for listing the information about our old Downey Retiree meetings. Now meeting at the Union Hall on the 1st & 3rd Thursdays. The meeting time is 11 AM not 10 AM as listed in the fall Bulletin.
There are a few corrections needed. The Union Hall address is 14910 Garfield Ave., in Paramount, Calif., not 1410 Garfield Ave. in Downey, CA. The President's name is Bill Kelley not Bill Kelly. You can call him for info, at 1-714-637-9374.

About your new Bald Eagles Logo – since the Boeing Company doesn't support monetary (money) for the cost of paper, printing, & mailing of the Retirees Bulletin which is now supported by subscribers. Why don't you go back to the old NAA logo with the flying eagle? It's hard to tell what the new logo is. I've enclosed some logo examples you might use.
Thanks,

Joseph May, 6049 Graywood Aye, Lakewood, CA 90712-1156. Telephone: (562)920-9002

Andy's Notes: Thanks for keeping us up to date on our typos. Our readers now have the accurate information. We were not able to show your suggested logos but we did receive them. Thanks.

Retiree News Wanted

Hi Andy
This is from Don Dodson and we just had a conversation on the phone about the Retiree News and I would like to sign up if you can tell me how.
I sure hope I can get a copy of the Fall Issue and I will get some of the other guys to sign up too. If you will send me the information. Thanks a lot and you stay healthy and I will keep in touch with you. Thanks again.

Don and Mary Jo Dodson
mdodson342@aol.com.

Andy's Note: E-Mail response to Don gave him the information. He is also passing it on to some of the guys he plays golf with.

Tri-State Attendees

Andy,
It was great to talk with you this morning. This is the e-mail I promised and would appreciate it if you would add me to your address book. If you could send me email address of retirees that might be interested in using the myfamily.com web site, please send them to me.
Thanks again for the information....

Steve Carlson,
B-1 Palmdale stvnvee@email.msn.com

Andy's Note: We do not have a listing of others e-mail addresses except the few we put in the articles. The best we can do for you is to appeal to our readers to e-mail you and the you can retrieve the address.

Napa's Pete Kreider

That headline should have appeared in the Fall edition, not Ohio's Pete Kreider. When I was going through the mail bag column and inserting headlines I looked at the address of the article just prior which was a Ohio address. Shame on me for not catching the error while proofing.

Doug Alkire Remembers Joe Cobb

Dear Editor Juif,

The Fall, 2000 issue of the "Bulletin" carried an article on Page 7, which really caught my attention. My path crossed that of Joe Cobb in mid-1927, although I never actually met him face-to-face. I have not forgotten, and have never had the opportunity to thank him. I will, do it now, with the hope that he will read about it in the "Bulletin".

Here is the story: In 1927, during summer vacation, my dad paid for a two-week stay for me at the Alhambra YMCA camp with the Indian name "Ta Ta Pochon". The camp is located at Barton Flats, in a Primitive Area, a few miles South of Big Bear Lake. I was 9 1/2 years old, and it was my first stay away from home.

At the end of the fun-filled two weeks my dad brought the rest of our family up to take me home. While visiting with the camp leaders he discovered that Joe Cobb had arrived with his mother for the next camp session. Joe immediately became sick and his mother decided that she must take him back home.

Since his stay was already paid for, and it was too late to get a replacement camper up from the city, she offered his berth to my dad. He accepted the offer, which was free, and looked me up to tell me the good news.

Joe and his mother were already gone, so I did not have a chance to thank them. I have never forgotten the generosity and want to thank Joe for his part in it. I wonder if he remembers the incident?

I was never a movie actor except in my own home movies but I did serve as a sort of "Stand-in" for Joe for two weeks. He worked at North American for 30 years, and I worked for North American for over 33 years. so we did have some years overlapping where we were both at NAA for 21 years.
Keep up your excellent work, Michel, it is really appreciated.

Douglas Alkire,
220 East Hellman Ave., Monterey Park CA. 91755-1201

P.S. John Markel and I worked in the same group in Airframe Design in the early 50's. Several years ago I wrote to him at your office, but received no response. John, I have not forgotten you.



HERBERT ZIEGLER (ZEKE) HOPKINS was born on March 25, 1926. He passed away in September 28, 2000. He graduated into the Army Air Corps as a pilot from the USMA at West Point in 1946. In 1949, he received a Masters Degree in Aeronautical Engineering from Princeton University. He served as a Flight Test Engineer at Wright Field for two years, and was sent to Edwards AFB to attend the USAF Test Pilot School. In 1955, he accepted a position as a North American Aviation Engineering Test Pilot flying prototypes of the F-100 and A3J. Zeke was promoted, in 1962, as Chief of the XB-70 Flight Operations. He left North American Aviation in 1966 to accept the position of Director of Operation for Filper Research. Finally he joined McDonnell Douglas in 1968 as a Project Engineer and Program Manager on the DC-10 and T45-TS. He retired in 1991

BAKER, LUCY - died in Torrance, CA on September 26, 2000. Lucy retired after working 31 years in Plastics. Ken Fowler, who learned of her death from the obituary in the Daily Breeze, notified us.

CARPENTER, ALAN B., - 82 of Yorba Linda, CA an industrial engineer, died on September 30, 2000 of cancer. Al worked in Industrial Engineering at Autonetics and Space Division. Maxine Haun notified us.

CREACH, JESS, 84 1/2, passed away on November 12, 2000 in Torrance Memorial Hospital. JESS retired from LAD where he was a design checker in Tool Design on the B-1 program. Reported by Dumont Wing, a good friend.

HARCOURT, FRED, 70 - of Brea, CA died February 18, 2000 of complication from diabetes. Fred worked at Rockwell International as a Material Contract Manager. Information obtained from an obituary

KELLEY, LEON E., 65 - of Redondo Beach, CA passed away on September 25, 2000. He retired from North American Aviation after 39 years. Information from an obituary in the Daily Breeze.

LEWIS, GEORGE, 84 - passed away September 22, 2000 of heart and kidney failure. George was hired in 1936, he worked in Tooling Division at LAD and served as Tooling Superintendent for many years. Ted Ryan and George Wiley notified us.

NETHERTON, BILL –long time tooling employee, passed away on August 23, 2000 after a long struggle with emphysema. Bill worked fro the company from 1951 to retirement in 1982. He worked on many programs, the latest being the Apollo and the B-1. Rex Tabor notified us.

PORTER, JANICE - passed away in August. Janice worked in Production Planning and Production Control for more than 35 years. Her family notified us

REED, DAVID ARTHUR JR. , born in October 19, 1919, passed away on October 8, 2000 of natural causes. He worked in Engineering at North American Aviation. He retired from North American Rockwell in 1982. Information obtained from an obituary sent by Maxine Haun.

RIDHEART, WILLIAM H. "Bill" - passed away at his home in Lancaster, CA on June 10, 2000. Bill worked for North American Rockwell for 39 years. He started at the Columbus Division as an Aeronautical Engineer, he then transferred to LAD. He also worked at Edward AFB. He retired in 1982 as an Instrumentation Engineer. Joe M. Ozment, a retired Engineer from Palmdale, who now reside in Selmer, TN notified us of Bill's death.

ST. CLARE, C. KENDRICK , 79 - of Fullerton, CA, a supervisor for Rockwell International, died on September 20, 2000 of cancer. Information obtained from an obituary in an Orange County newspaper.

SUTTON, REX STANLEY, 81 - died at Western Medical Center in Irvine, CA on September 30, 2000. Rex worked at LAD in design and management positions in Engineering on many programs including the B-1 and the Sabreliner. Information obtained from an obituary in an Orange County newspaper.

THOMAS, HANNAH MAE, the mother of **VAL YARBROUGH**, RB Treasurer and Chairperson of the Bald Eagles, passed away at the age of 99 on November 2, 2000 of natural causes. Hannah was born on August 21, 1901 in Rocky Ford, CO. On behalf of the Bulletin Staff and the Bald Eagles directors we extend our sympathy to Val for the loss of her loved one.

THE BALD EAGLES, INC. PAGE

BALD EAGLES ANNUAL REUNION

THE 39th ANNUAL BALD EAGLES REUNION WILL BE HELD ON SATURDAY, APRIL 21, 2001, AT THE PROUD BIRD RESTAURANT, 11022 AVIATION BLVD. (AT 111TH STREET). DOORS OPEN AT 10:00 AM FOR VISITING. SEATING FOR LUNCH AT 12:00 NOON.

IF YOU PLAN TO ATTEND, SEND A CHECK PAYABLE TO BALD EAGLES, INC. FOR $20.00 FOR **EACH MEMBER IN YOUR PARTY** TO:

VAL YARBROUGH
520 DEL ORO DRIVE
OJAI, CA 93023-1805
TEL: (805) 646.2283

INCLUDE WITH YOUR CHECK THE NAME(S) AS THEY SHOULD APPEAR ON THE BADGES FOR EACH PERSON FOR WHOM YOU ARE ORDERING TICKETS.

TICKETS AND NAME BADGES WILL BE HELD AT THE ENTRANCE.
THE BALD EAGLES REUNION AREA WILL BE CLEARLY MARKED.

SORRY, THERE CAN BE NO REFUNDS AFTER APRIL 2, 2001.

THIS IS THE ONLY NOTICE YOU WILL RECEIVE ABOUT THE EVENT. SHARE THIS NEWS WITH OTHERS WHO HAVE AN INTEREST IN NORTH AMERICAN AVIATION/ROCKWELL, ITS HISTORY, AND ITS EXTRAORDINARY HERITAGE OF PRODUCTS AND PEOPLE. THERE IS NO MINIMUM COMPANY SERVICE REQUIREMENT FOR ATTENDANCE - - JUST $20.00 AND AN INTEREST IN THE COMPANY AND ITS PEOPLE. WHAT A GREAT TIME TO SEE OLD (AND NOT SO OLD) FRIENDS!

SEE YOU THERE.

Farewell
20th Century

WE THE WILLING LED BY THE UNKNOWING
ARE DOING THE IMPOSSIBLE
FOR THE UNGRATEFUL.
WE HAVE DONE SO MUCH FOR SO LONG
WITH SO LITTLE
WE ARE QUALIFIED TO DO
ANYTHING WITH NOTHING.
The Retiree News Staff

Hello
21st Century

As we are closing the 20th century, the above verse summarizes our endeavor, over the past decades, that we so diligently and faithfully devoted to the Retirees of NAA and Rockwell. ***Happy New Year everyone!***

Retirees Bulletin Office
2600 Westminster Blvd.
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Seal Beach, CA 90740-7644

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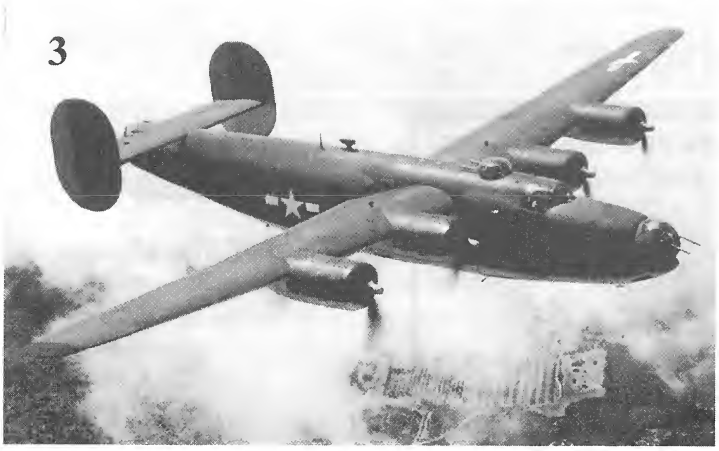
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Answers can be found, somewhere, inside this issue.

NORTH AMERICAN AVIATION
Retirees Bulletin

DEAR NAA RETIREE BULLETIN SUBSCRIBERS

We sent out 9000 copies of the Winter 2000 issue and over 2800 of you chose to subscribe! The roster of Silver Eagles continues to grow, currently 8% of you subscribers are life members! What is more important, your letters indicate that you are pleased with our efforts.

However, we did receive one blistering phone call from a subscriber because we left out the passing of her friend, a retired secretary, from the Silent Majority. The implication being that because she was only a secretary, we purposely slighted her name. Nothing could be further from the truth! This was an error of confusion and not of omission! We treat the passing of all retirees, regardless of their status on earth, with equal sadness and dignity! We know that Donna Lewis is with the angels and that she has forgiven us. We say that because if she was a secretary at NAA/Rockwell she already was an angel!

As you may have noticed, the NAA Retirees Bulletin has made some major advancement in the past three issues. The entire bulletin is now computerized and sent to the printer on a disc. The addressing is also on a disc and printed directly on the bulletin by a direct mail vendor. This has eliminated much of the volunteer manual operations and we are now free to dedicate our attention to the contents and quality of the bulletin itself.

Although we know that many of you first turn to the Silent Majority. We also know that you want to read about the important and interesting programs and events that were part of North American Aviation and Rockwell history, not only at LAD but at Space, Autonetics, Rocketdyne, Atomics International, Columbus, Tulsa, Palmdale, Edwards AFB and the Kennedy Space Center. Therefore, we are seeking out the people who were there to help us record these happenings. In this issue, Norm Avery, a recognized author and NAA engineer, provides us with a very colorful chapter about the B-25. We invite other hands-on historians with a story to tell, to take the time and put it down for others to enjoy. The pay is terrible but the gratitude is immense!

In keeping with this goal, we garnered the services of Dr. Raymond Puffer of the Edwards AFB History Office. He is already on the job and has submitted several articles about NAA aircraft.

Our Spring 2001 Issue went out to all subscribers and we already received almost a dozen returns because the recipient moved and did not notify us. If we are lucky and the post office provides a forwarding address, it costs us 55 cents to re-send the bulletin. If you change your address, please let us know so we can promptly update our mailing lists.

We also received many calls because the Post Office took its sweet time to deliver the NAA Retirees Bulletin in certain areas. Once it is turned over to the Post Office, we have no control regarding delivery. Evidently, several trays containing the bulletins were misplaced and not delivered as addressed. To resolve this problem, we went to first class mail with this Summer Issue. It is more costly but everyone gets their copy at the same time!

In closing, we are pleased with the 2800 that chose to subscribe but we are sorry for the 6200 that did not. We think that they will miss out on some great articles and stories. If you know any of these people, you may want to take pity on them and send them a gift subscription! In any case, God Bless you all!

NAAR is an affiliate of the **Bald Eagles, Inc.** and is an independent non-profit organization created and operated by volunteer retirees of NAA/Rockwell/Boeing.

The NAAR office is located at Boeing, Seal Beach facility. Send mail to:
Retirees Bulletin Office
2600 Westminster Blvd
PO Box 3644, M/C SJ 51
Seal Beach, CA 90740
Or call: ☎ (562) 797-3836
Or Fax: (562) 797-3848

NAAR Staff
(562) 797-3836

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Guest Historian	Dr. Raymond Puffer
Technical Advisors	Mike Davis John Flavin, John Markel Ken Fowler Howard Axtell Robert Nease Joe Onesty

MEMBERSHIP FORM

Yes, I am a retiree of NAA/Rockwell and I want to be a member and receive the NAA Retirees Bulletin. I am enclosing a check payable to the Bald Eagles, Inc. for $ _____
For every $10.00, I will receive four issues.

Name _____
Street Address _____
City/State/Zip _____

I retired from_____ Division
After _____ Years of Service

You may also send a gift subscription to another NAA retiree. Just give us the name and address of the recipient along with your payment and we will send a gift card to him

MOVING? ON EXTENDED VACATION?

If you are moving or you are "Snowbirds" taking an extended vacation at another location, please let us know your new address as soon as possible.

We receive several dozen returns with each issue indicating the subscriber has moved — sometimes with a new address on a yellow label and sometimes with the rather somber "Address Unknown". It is not clear whether the recipient has joined the "Silent Majority" or is out there somewhere?

For you "Snowbirds" — Your Bulletin is returned to us stamped with "Temporarily Away" with no indication when you will return. So please give us your new address as soon as possible and send the information to:

NAA Retirees Bulletin
2600 Westminster Blvd
PO Box 3644, M/C SJ51
Seal Beach, CA 90740

NAA/ ROCKWELL/BOEING RETIREE CLUBS AND GROUPS

The Old Downey Club meets at 11:00 AM every 1st and 3rd Thursday of each month at the UAW Union Hall, 14910 Garfield Avenue in Paramount. The president is Bill Kelley at (714) 637-9374
TheAntelope Valley Retiree Club meets temporarily in Courson Park at 10:00 AM every 2nd and 4th Monday of the month. All NAA/Rockwell retirees are welcome. For information call Bill "Tiny" Kisler at (661) 273-0213.
The Boeing Valley Retiree's Club meets on the 3rd Thursday of each month at the Canoga Park Rec. Center. 8500 Fallbrook Ave. Canoga Park, CA. President: Jennie Muncaster, dial (818) 341-8919
Autonetics Retirees meets for lunch at 11:45 AM on the 2nd Wednesday of each month at the Rembrandt Restaurant, 909 E. Yorba Linda Blvd., Placentia CA. All Autonetics retirees, spouses and friends are invited.
"Ye Olde Pharts Breakfast Club" - A group of retired Autonetics Quality personnel meets for breakfast on the 4th Thursday of each month at 10 AM at Coco's on Tustin Ave. and Lincoln Blvd. In North Orange. For information, call Don Metzger at (949) 495-5374.
A group of NAA Retirees meets for breakfast on the 1st Wednesday of each month at the Knott's Berry Chicken Farm Restaurant at 8:15 AM. All are invited.
A group of Retirees from Seal Beach meets at 11:30 AM at "The Fish Co", Los Alamitos and Katella, on the 3rd Wednesday of each month. For more information, call Marvin Blaski at (714) 848-5717 or e-mail: mblaski@aol.com
"Aerodynamics, Thermodynamics, Propulsion and Wind Tunnel Retirees" meets for lunch on the 2nd Wednesday at 11:30 AM at the Sizzler Restaurant in El Segundo, corner of Sepulveda Blvd and Mariposa Ave.
"The Old LAD Stress Group" meets approximately every two months at Mimi's Café in Torrance, CA for breakfast. If you were in the old LAD Stress Group and want to join them, contact Gene Laxton (310) 378-3113 or Ed Rosenthal at (310) 375-8933
The Downey Engineering Group of Retirees known as "The Choir Boys" meets every Thursday for lunch at various restaurants from Seal Beach to Downey. Call Al Risi at (714) 892-5725 for meeting location.
GPS Breakfast Club meets every Wednesday morning from 6:00 to 8:00 AM at the Primrose Restaurant at the corner of Seal Beach Blvd and Westminster Blvd. All are invited, retired or not.
The Facilities, Industrial Engineering and Plant Services Retiree Group meets on the 2nd Thursday each month at the Jolly Roger in the Long Beach Marina at 11:45 AM. Friends and wives, former and current employees are welcome.
The North American Rockwell Retirees Club of McAlester Oklahoma (a satellite of Tulsa, OK) meets each month on the 3rd Tuesday, 10:30 AM at the Down Town Meeting Place. For more Information contact:
J. A. Darden, 343 W. Adams Ave. McAlester, OK 74501 or phone (918) 423-0706.
Tulsa & McAlester Retirees meet for breakfast at 8 AM on the 2nd monday of March, June, September & December at the Harvest Buffet, 3637 S. Nemovial Drive, Tulsa. Call Harry Phillips for more detail at (918) 838-3716.
The North American Rockwell Retiree Group of Columbus, OH. Engineers and Professionals meet each month on the 3rd Thursday at 11:30 AM at the Berwick Park House. For more info. contact Byron C. Solomides at (614) 486-3239.
NAA/Rockwell U.A.W. Group of Columbus, OH, meets on the 1st Monday of each month at Noon at the Old Rockwell Park (North Hamilton Rd.) E. Hamilton at (740) 927-5940.
Autonetics Group that includes Marine Systems, Program Office, Project Office, System Test, Engineers, Designers, etc. meets for lunch on the last Wednesday of each month at the Hometown Buffet, Rose Avenue and Alta Vista Drive in Placentia. For more information call Mike Vohs at (714) 762-1925.
A group of NAA Retirees from 101 Tooling meets for breakfast at 10:00 AM on the 1st and 3rd Thursday of each month at the Cimarron Café at 5160 190th St., West of Anza Avenue in Torrance.
Autonetics Finance Luncheon. This group meets for lunch the last Wednesday of the month at Carrow's located at 100 N. State College in Fullerton. Anyone interested can call Ken Cantwell, at (714) 970-7171 or send e-mail at: kcantrell@prodigy.net, to obtain more information.
Autonetics Industrial Engineering and Maintenance Retirees meet for lunch the 1st Thursday of each month at the Hometown Buffet, 390 McKinley, located in front of Home Depot, in Corona. For more information call Don Burt at (909) 698-0072
NAA Tech Reps Assn. (TRA) Breakfast Club meets the 1st Tuesday of each month at the Carlsbad Airport Restaurant at 9:00 AM.
For more information call: El Presidente, Rafael Colunga at (760) 940-0525
A Group of Engineers Mgt. , meets on the 3rd Tuesday monthly at Denny's on Imperial Hwy and 57 Fwy. at 11:30 AM for lunch. For more information call Ed Moran at (562) 697-9949
Autonetics Flight Control Retirees meet on the 3rd Thursday of every month, except December, at 11:30 AM at "The Lamppost Pizza House" located at 17568 Yorba Linda Blvd. corner of Richfield Road in Yorba Linda.
Call Jim Anderson at (714) 779-5620 for more information.

ANNUAL EVENTS

The "Warbird Round-Up", sponsored by the Santa Maria Museum of Flight - September 14th - 15th, 2001 at the Santa Maria Airport
Bald Eagles Reunion - The 39th Annual Reunion is on April 21, 2001, call Val Yarbrough at (805) 646-2283
Grants Pass Picnic - 1st Wednesday after Labor Day, September 5, 2001
NAA-K B-25 Reunion will be held on Sunday, August 19, 2001 from 1 to 5 PM at the Wyandotte County Museum. For more information call Harry J. Desko (913) 287-7223 or write to him at 3024 N. 47th St., Kansas City, KS 66104.
Flying Horsemen For year 2001, information regarding events and reunions may be obtained from the troop secretary, Harold Shapiro at (714) 993-3496, FAX (714) 993-1208, e-mail shapsplace@aol.com or mail to 17822 Kennon Dr., Yorba Linda 92886
The Hangar Gang - This group of retirees meets approximately every 6 months. For time and date or additional information call Gene Salvay (818) 788-3974, or write to him at: 17201 McCormick St., Encino, CA 91316, or call Dave Wisted at (310) 833-0587.
Annual Flight Test Instrumentation Reunion - This group of retirees meet annually at the Fullerton Elks Club. For Information call Ed Mosbrook at (714) 531-8060 or Frank Vigil at (562) 691-0236.
Tech Rep Association—a group of retired Field Service Technical Representatives has a yearly picnic in June at the park in Fallbrook. For more information, contact the TRA President Rafael Colunga, 5705 Redondo Dr., Bonsall, CA 92003 or at his e-mail address: rafael@nctimes.net
The Annual M&P, P.D.L., "Friends Christmas Luncheon". This group of retirees (and some still employed) have assembled in mid-December for a festive luncheon and gab-fest for the past 18 years. The last two luncheon were at South Bay Grill and Luig's.
Those wishing to receive notice of next December Luncheon, please call Fred Koeller at (310) 545-8854.
2001 Group Reunion Luncheon for TRI-STATE Members - This group will meet on Wednesday, October 17, 2001at 11:00 AM to 3:00 PM (PST) at the Lancaster Elks Lodge #1625, 240 East Avenue K. Lancaster, CA 93534. For reservation call one of the committee member : Bill Bright at (661) 943-7276 or Steve Carlson at (661) 944-9698 or Jim Beall at (661) 945-1326
E-mail: bbright@hughes.net E-mail: Stvnvee@msn.com E-mail: jjbell@as.net
Saturn S-II Reunion - will be held on May 4 th or May 18,, 2002 at the Grand Hotel in Long Beach, CA. Those interested in paticipating or attending should contact Al Otto at (714) 775-4721 or e-mail him at gypsyma@aol.com.

Continued on page 4

The Editor's Corner

CLARIFICATION ON U. S. SAVINGS BONDS

This is an update on the "U.S. Savings Bonds Have Limits" column that appeared on the Editor's Corner of the Spring Issue.

The first U.S. Savings Bonds Series EE issued January 1980 will reach final maturity on January 2010 (30 years), presently the $25 Bonds are yielding 7.45% with a redemption value of $116.

U.S. Savings Bonds Series E have different final maturity terms (30 and 40 years).

Forty years $25.00 Bonds issued May 1941 through April 1960 have a final maturity value from $90.00 to $192.00. Also $25.00 Bonds issued from may 1960 through May 1961 have a final maturity redemption value from $192.00 to $201.00.

These Savings Bonds are not eligible for exchange to series "HH" Bonds.

Other bonds issued in 1961 through November 1965 will reach maturity 40 years later from the date of issuance, i.e. during 2001 through November 2005.

Thirty-year $25 Bonds issued in December 1965 through April 1970 have a final redemption value from $128.00 to $137.00. Also $25 Bonds from May 1970 through 1971 will reach their full redemptions values from $127.00 through $137.00.

Bonds issued in 1971 trough June 1980 will mature in full in 2001 through 2010.

This information is from the Tables of Redemption Values issued by the Department of Treasury Bureau of the Public Debt.

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Miscellaneous Information

All NAA / Rockwell / Boeing Retirees that have a need to contact the BNA Benefits Center must have their Personal Identification Number (PIN) available before attempting a call to the Center.

The telephone Number is 1-800-438-3116. The business hours are from 10 AM to 6 PM (EST) M through F.

If you don't have one or forgot your PIN, you must write to the Center:

BNA BENEFITS CENTER
PO Box 24567
Jacksonville, FL 32241-4567.

Services provided by the Center are:

Life events, enrollment or change in medical/dental plans, address changes, plan comparisons of medical benefits, answers to general health/dental/vision and life questions, health care/Life Insurance direct billing procedures and confirmation statements.

The above information does not apply to retirees from the Rockwell Corporate Offices. These former employees remain under the Rockwell Corporation benefits and pension plans

Other Services Available to Retirees

The Boeing California Employee Fitness, Inc. location at Seal Beach is available only to Retirees. To access the facility, retirees must exchange their Retiree Card for a temporary "Retiree" badge at the Gate 510 Security window on Westminster Blvd.

However, the fitness centers at Anaheim and Huntington Beach are now open to retirees and their dependants On your first visit, stop at the office and fill out a short form and receive a dependant card.

Discount tickets to recreation parks are no longer available at the Fitness Center. However, there is another source available. For Employee Services discount tickets:

www.Boeing.esvp.com/, if you have internet, if not: call 1-877-641-7283

Retirees on tours wishing to rent a car can benefit from the Boeing Corporate Discount.. The company negotiated contract agreements are: No. 5555501 for National and No. 147616 for Alamo.

Refer to the pertinent number when negotiating a rate for car rental at National or Alamo. Have your retiree ID card with you all the time

Dear Readers

It is with regrets that I must inform you, readers and supporters, that I will be resigning from the position of Editor of the North American Aviation Retiree Bulletin as of December 31st 2001.

I have been a volunteer Retiree News staff member since 1990 and took on the position of Editor in 1994 following the relocation of the office from LAD to Downey and I will continue on the staff for the next three editions in order to give ample time to locate and instruct new replacements.

In order to continue the publication of the Bulletin, as is, one must be capable of operating a computer to the fullest and be proficient with Windows 98, Microsoft Words and Microsoft Publisher, he must also have a scanner at his disposition and be able to work with graphics and photos. A CD Writer is also required to transfer the entire content of a bulletin issue from the hard drive to the disc. This is now the accepted method for publishing. The days of "cut and paste" and photocopy methods are over.

My sincere thanks to all my dedicated staff members that includes: Walt Jones, Gloria Farquhar, Ed Rusinek, Ken Fowler, John Flavin, John Markel, Andy Tindley, Maxine Haun, Howard Axtell, Sonnie Robertson, Jo Ann Kock, also, our treasurer, Val Yarbrough and Technical Advisors, Mike Davis, Joe Onesty and Robert Nease.

We have worked hard for the continuation of a retiree newspaper and we sincerely hope that it will continue to be published and grow.

Also, one of my best friends, Co-Editor Walt Jones has expressed his desire to retire from this staff at the end of this year. Walt has been on the Retiree News staff since 1984, and was chosen as Co-Editor in 1994. Walt has always been a faithful and dedicated volunteer, he has devoted his time mainly on the "Silent Majority" and we all owe him a ton of gratitude for his invaluable help.

Declining health, change of priorities in our lives and personal reasons among other considerations, prompted this action.

We wish the best of luck to the staff and to the future Editor and Co-Editor of the Retiree Bulletin.

Respectfully yours,

Michel Juif, editor

The Grants Pass Picnic will be on September 5, 2001. Don't miss it. For more information and how to get there, call either Gil Judson at (541) 582-0675 or Bob Morse at (541) 474-1438.

The **"Warbirds Round-Up".** A special program for NAA/Rockwell/Boeing employees and retiree will be held at the museum on Friday, September 14th at 1:00 PM. Any NAA memorabilia for display would be greatly appreciated. For more information, contact Marv Nichols at (805) 925-1349

THE NORTH AMERICAN AVIATION B-25H PROJECT NA-98X

BY NORM AVERY

A question frequently asked: "Has North American Aviation ever produced B-25s powered by Pratt & Whitney R-2800 engines?" The answer is an emphatic "No". However, at the request of Wright Field Engineering in early 1944, the Inglewood Division did retrofit a single B25H with R-2800 engines as Project NA-98X.

The reasons for the Army Air Force request were not made clear but in all probability the AAF was growing impatient with the delays in getting the Douglas A-26 into production. The A-26 was scheduled to replace many of the B-25s in the Southwest Pacific Theater.

General George Kenney, commander of the 5th Air Force in the Pacific, was willing to finish the war with his B-25s and offered several criticisms of the A-26. He also expressed doubts that at its current rate of development, the A-26 would even be ready for "this war". There was obvious support from Wright Field with the view of a production contract since the basic airframes were already being produced in large numbers at both Inglewood and Kansas City and would cost much less than the new A-26.

In response to the AAF request, NAA began modification of B-25H #43-4406 accompanied by a proposal defining three production configurations: a conventional medium bomber and two attack strafer bombers, all powered by P & W R-2800-51 engines using Bendix Stromberg carburetors with water injection. One strafer variant utilized the factory eight-gun nose, two .50 cal waist guns and carried four 500-pound bombs. The so-called "super strafer" carried the same armament plus four more .50 cal guns in forward fuselage blister packs. This was the heaviest design at 35,522 pounds.

The only visual differences from a standard B-25H were the high-speed inlet A-26 cowlings, large propeller spinners and the squared P-51 type wing tips. The wingspan remained unchanged at 67 feet 6.7 inches. The revised tip shape permitted a 12 inch increase in aileron span; thereby, increasing the aileron area by one square foot.

Based on a gross weight of 34,000 pounds, calculations indicated a top speed of 300 mph at military power and a rate of climb of 1800 feet per minute at sea level. Predicted high speed at emergency power was 325 mph.

The additional power and speed of the revised airplane, combined with increased aileron area, redesigned controls reducing stick forces and increased roll rate would require considerable structural reinforcement of the nacelle and wing structure for production units. These changes plus the heavier engines would add 1,500 pounds to the gross weight. The higher maneuvering speeds could induce excessive bending moments in the wings. To counter leading edge torsion, the rivet size was increased for the attachment of the leading edge skins.

The required flight test data could be safely obtained without the structural reinforcement by imposing restrictive parameters. Maximum speed for all test flights was, therefore, restricted to 340 mph IAS and a normal acceleration of 2.67 g. Except for removal of the forward fuselage gun packs, the standard B-25H armament was retained on the NA-98X during the entire test program.

Accompanied by test engineers Talman and Johnson: NAA engineering test pilot Joe Barton made the first flight on 31 March 1944, a one hour functional check. Fifteen more flights were made through 20 April 1944 by Barton, chief test pilot, Ed Virgin, RAF Squadron Leader Hartford and AAF pilots Major McIver and Captain Fountain. All agreed that the improved performance clearly indicated that the B-25 should have been assigned the R-2800 engines from the beginning.

In 1944, Mines Field ended on the west at Sepulveda Boulevard, at the time a two-lane thoroughfare. Aviation Boulevard marked the eastern edge of the field, making the runway about a mile long. An anti-aircraft battery was located at the northwest corner of the field and the troops stationed there were avid observers of the NA-98X as flight-testing progressed. Some even had part time jobs with North American Aviation.

On 22 April 1944, the test program was taken over by Major Perry Ritchie and Lieutenant Winton Wey of the AAF. Ritchie was a graduate engineer and an experienced military test pilot but was generally known to be somewhat spectacular. After completing each programmed flight, he flew out over the Pacific Ocean, dropping low to just above the surface of the water. Then a hop over the Playa Del Rey sand dunes and "on the deck" at full throttle eastbound for the NAA flight ramp. His exhibitions usually ended with a steep pull up and climbing spiral before entering the landing pattern. Although, he was emphatically cautioned by NAA structures engineering and company test pilots, he chose to ignore their warnings to stay within established red line parameters.

On 24 April 1944, the troops on the field interrupted a ball game to watch another Ritchie low level, high speed run. They were not to be disappointed! Reaching the NAA flight ramp, he made the usual sharp pull up. At an altitude of about 200 feet, both outer wing panels separated and knocked the tail off. The airplane rose about another 100 feet and crashed a little northeast of the present site of the Proud Bird Restaurant. Both crewmen were killed instantly. The airplane did not burn. The flight ramp and the camouflage netting above it were strewn with debris. One outer panel fell on the net intact, making for an easy analysis. That no one on the ground was hurt seems miraculous but such was the good fortune. The accident investigation report concluded that the airplane was simply flown beyond its structural limitations.

The North American Aviation Project NA-98X is a classic example of a victim of circumstances! The tragic and unnecessary crash precluded any possibility of a production contract. A historically common result even when the airplane was found not to be at fault. At the time, this type of B-25 had valid applications. Victory in Europe was a year away and Japan remained a formidable foe against whose forces the B-25 had proven very effective. Had the crash not occurred? I believe there was an excellent chance that a production contract would have been issued. I well remember this airplane since I made the drawings for the exhaust collector for the upper cylinders. The evening of the crash I was able to enter the crash site escorted by an officer friend from the AA battery whose troops also guarded the wreckage.

ABOUT THE AUTHOR

Norm Avery joined NAA in 1944 as *a draftsman in the Engineering Power Plant Group working on the B-25, P-51, AT-6, XAJ-1 and numerous other aircraft including the B-70 and B-1. He retired in 1980 from the Energy Systems Div in Canoga Park after some 12 years of mechanical design in support of atomic energy. Norm has contributed numerous scholarly articles to the Journal of the American Aviation Historical Society and has written two books. He is the author of:*

NORTH AMERICAN AIRCRAFT 1934-1998 VOL 1

and

B-25 MITCHELL, THE MAGNIFICENT MEDIUM.

Both books are available from Markiewicz/Thompson at (714) 542-7145. Jon Thompson will give a special rate for NAA retirees so call for particulars. Norm now resides in Mt. Shasta, California.

THE ACORN DAYS

BY DENHAM S. SCOTT

How many of you know that in 1910 the mighty Martin Marietta Company got its start in an abandoned church in Santa Ana, CA? That's where the late Glenn L. Martin with his mother "Minta" Martin, and a mechanic named Roy Beal, built a fragile contraption with which Glenn taught himself to fly.

It has often been told how the Douglas Company started operations in 1920 by renting the rear of a barbershop on Pico Boulevard in Los Angeles. The barbershop is still there. The Lockheed Company built its first Vega in 1927 in what is now the Victory Cleaners and Dyers at 1040 Sycamore Avenue in Hollywood.

Claude Ryan, who at 24 held a reserve commission as a flyer, had his hair cut in San Diego one day in 1922. The barber told him how the town aviator was in jail for smuggling Chinese across the border. Claude investigated and stayed on in San Diego to rent the old airfield from the city at fifty dollars a month and replace the guy in the pokey. He agreed to fly North instead of South.

In 1928, the Curtiss Aeroplane and Motor Company, Transcontinental Air Transport (now TWA) and the Douglas Company chipped in enough money to start North American Aviation, a holding company. The present company bearing the Northrop name came into being in a small hotel in Hawthorne. The "hotel" was conveniently vacant and available because the police had raided it and found that steady residents were a passel of money-minded gals who entertained transitory male guests.

After Glenn Martin built his airplane in the church, he moved to a vacant apricot cannery in Santa Ana and built two more. In 1912 he moved to 9th and Los Angeles Streets in downtown Los Angeles. Glenn Martin was then running a three-ring circus. Foremost, he was a showman who traveled the circuit of county fairs and air meets as an exhibitionist aviator; secondly, he was an airplane manufacturer. He met his payroll and bought his lumber, linen and bailing wire from the proceeds of his precision exhibition flying. His mother, "Minta" and two men ran the factory when Glenn was risking his neck and gadding about the country. One of these was 22-year old Donald Douglas who was the whole of his engineering department and the other was a Santa Monica boy named Larry Bell who ran the shop.

The third circus ring was a flying school. It had a land plane operation in Griffith Park and later at Bennett's Farm in Inglewood; and a hydroplane operation at a place that's now part of the Watts District. A stunt flyer named Floyd Smith ran it. One of his first pupils was Eric Springer, who later became an instructor and then Martin' s test pilot, still later the test pilot for the early Douglas Company, and then a Division Manager.

Between Eric and Floyd, they taught a rich young man named Bill Boeing to fly. Having mastered the art; Boeing bought a Martin biplane, hired Ross Stem, Glenn's personal mechanic, and shipped the airplane to Seattle. Later, when it crashed into the lake and Boeing set about to repair it, he ordered some spare parts from Martin in Los Angeles.

Martin, remembering the proselytizing incident with Ross Stem, decided to take his sweet time and let Boeing stew. Bill Boeing said, "To Hell with him", and told Ross Stern to get busy and build one of their own. Boeing had a friend named Westerfelt and they decided to form a company and build two airplanes. These two "BW" airplanes bore a remarkable resemblance to the Martin airplane which, in turn, had been copied from Glenn Curtiss. There seems to be a moral about customer relations and product support mixed up in this episode.

During WW I, a bunch of sharpies from Wall Street in New York got control of the Wright Company in Dayton and the Martin Company in Los Angeles. They merged the two companies into the Wright-Martin Company. They sent a young man named Chance Vought to be their Chief Engineer. Donald Douglas lost no time in quitting and went to work for the U. S. Signal Corp.

The Wright-Martin Company started building obsolete "Standard" biplanes and Hispano-Suiza engines, with the latter under a license agreement with the French Government. Martin told them what they could do with them, and took off for Cleveland, taking Larry Bell and Eric Springer with him. Having the backing of a baseball mogul to build a new factory, he was soon joined by Donald Douglas who went to work and came up with the design of the Martin Bomber. It came out too late to see service in WW I, but showed its superiority when General Billy Mitchell made everyone mad at him by sinking the captured German battlefleet. The deathblow to the allegedly Dreadnaught "Osfriesland" was delivered by the Douglas designed Martin Bomber.

At Cleveland, a young fellow called "Dutch" Kindelberger joined the Martin Company as an engineer. Also a veteran Army pilot from WW I named Carl Squier became Sales Manager. His name was to become one of the most venerable names in Lockheed history.

Back in 1920, Donald Douglas had saved $600.00 and struck out on his own. He returned to Los Angeles, found a backer, David Davis, rented the rear of a barber shop and some space in the loft of a carpenter's shop where they built a passenger airplane called "The Cloudster". Claude Ryan bought this a couple years later, which made daily flights between San Diego and Los Angeles with it. This gives Ryan the distinction of being the owner and operator of the first Douglas Commercial Transport, and certainly a claim to be among the original airline passenger operators.

In 1922, Donald Douglas was awarded a contract to build three torpedo planes for the US Navy. Douglas lived in Santa Monica, but worked in Los Angeles. Way out in the wilderness at what is now 25th Street and Wilshire Boulevard in Santa Monica, there was an abandoned barn-like movie studio. One day Douglas stopped his roadster and prowled around to investigate. The studio became the first real home of the Douglas Aircraft Company.

With the $120,000 Navy contract, Donald Douglas needed and could afford one or two engineers. He hired my brother Gordon Scott, newly over from serving an apprenticeship to the Martinside and the Fairey Aviation Companies in England. Gordon was well schooled in the little known science of Aviation by 1923.

My first association with some of the early pioneers occurred when I visited my brother Gordon at the barn at 25th Street. I found him outside on a ladder washing windows. They were dirty and he was the youngest engineer. There were no janitorial services at the Douglas Company in those days.

Gordon introduced me to Art Mankey, his boss and Chief Draftsman, and four of his fellow engineers. There was a towhead guy called Jack Northrop, a chap named Jerry Vultee, and a fellow named Dick Von Hake who was a reserve Army flyer. Jack Northrop came from Santa Barbara where he had worked during WW I for the Lockheed Aircraft Manufacturing Company. The fourth member of the Engineering Group was Ed Heinemann. They were all working on the design of the Douglas World Cruisers. Shortly afterwards, Jack Northrop left the Douglas Company in 1926. Working at home, he designed a wonderfully advanced streamlined airplane. He tied back with Allan Loughead who found a rich man, F.E. Keeler, willing to finance a new Lockheed Aircraft Company.

ACORN Page 7

They rented a small shop in Hollywood and built the Northrop designed Lockheed "Vega". It was sensational with its clean lines and high performance.
In May 1927, Lindbergh flew to Paris and triggered a bedlam where everyone was trying to fly everywhere. Before the first Vega was built, William Randolph Hearst, publisher of the Hearst newspaper chain, bought it and entered it in the Dole Race from the Mainland to Honolulu, which was scheduled for 12 August 1927.
In June 1927, my brother Gordon left the Douglas Company to become Jack Northrop's assistant at Lockheed. He also managed to get himself hired as the navigator on the "Golden Eagle"; the name chosen by Mr. Hearst for the Vega which hopefully would be the first airplane to span the Pacific.
The race was a disaster! Ten lives were lost. The "Golden Eagle" and its crew vanished off the face of the earth.
With its only airplane lost under mysterious circumstances, a black cloud hung heavily over the little shop in Hollywood. However, Captain George H. Wilkins, later to become Sir Hubert Wilkins, took the Number Two airplane and made a successful polar flight from Nome, Alaska to Spitzbergen, Norway. After that a string of successful flights were to put the name of Lockheed very much in the forefront of aviation.
At Lockheed, Jack Northrop replaced the lost Gordon Scott with Jerry Vultee.
In 1928, Jack quit the Lockheed Company to start a new company in Glendale called Avion. Jerry Vultee then moved up to become Chief Engineer at Lockheed. He hired Dick van Hake from the Douglas Company to be his assistant. A young man named Cliff Garrett joined the Lockheed as the driver of their pick-up truck.
I went to work at Lockheed shortly after the "Golden Eagle" was lost. I became the 26th Lockheed employee. The Vegas were made almost entirely of wood and I became a half-assed carpenter, generally known as a ''wood butcher''.
In 1929, Jerry Vultee quit the Lockheed Company to start the Airplane Development Company, which became the Vultee Aircraft Company, a division of E. L. Cord, the automobile manufacturer. He later merged with Reuben Fleet's Consolidated Aircraft Company to become Convair. When Vultee left Lockheed, Dick van Hake became the Chief Engineer.
In the meantime, Glenn Martin closed his Cleveland plant and moved to Baltimore. His production man, Larry Bell, moved to Buffalo to found the Bell Aircraft Company. Carl Squier left Martin to tie in with the Detroit Aircraft Company 'which had acquired the Lockheed Aircraft Company and seven others. They hoped to become the "General Motors" of the aircraft business! They appointed Carl Squier as General Manager of the Lockheed plant, which moved to Burbank in 1928.
At this time, General Motors had acquired North American Aviation, which consisted of several aircraft companies in the East. Ernie Breech, formerly with Bendix but now with General Motors, hired "Dutch" Kindelberger away from Douglas to head up the aircraft manufacturing units. "Dutch" took Lee Atwood and Stan Smithson with him. The companies involved were Fokker Aircraft, Pitcairn Aviation (later Eastern Airlines), Sperry Gyroscope and Berliner-Joyce. Kindelberger merged Fokker and Berliner-Joyce into a single company and moved the entire operation to Inglewood, California.
Thus, a handful of young men played roles which profoundly affected all of our lives and the lives of millions of other Americans. They changed Southern California from a wasteland with a few orange groves, apricot and avocado orchards and the celluloid industry of Hollywood to a highly sophisticated industrial complex with millions of prosperous inhabitants. This technological explosion had some very humble and human beginnings. The "Acorns" took root in some strange places: a church, a cannery, a barbershop and a bawdyhouse, but from them mighty Oaks have indeed come to fruition.

From a speech given by Mr. Denham S. Scott to the AIA on March 19, 1968

DURING A RECENT VISIT TO THE HISTORY OFFICE AT EDWARDS AFB, STAFFER ED RUSINEK ENJOYED THE HOSPITALITY OF A MEETING WITH THE CHIEF HISTORIAN, DR. JAMES YOUNG, AND HISTORIAN, DR. RAYMOND PUFFER. IN ADDITION TO A TOUR OF THE FACILITY, ED OBTAINED THE USE OF HISTORICAL DATA AND PHOTOS FROM THE VAST RESOURCES OF THE HISTORY OFFICE, EVEN MORE IMPORTANTLY, DR. PUFFER GRACIOUSLY VOLUNTEERED TO WRITE FOR THE BULLETIN AS A GUEST HISTORIAN, THE MEETING TOOK PLACE IN FRONT OF A HUGE MONTAGE OF AEROSPACE MEMORABILIA MOUNTED ON THE CONFERENCE ROOM WALLS



In the picture, from left to right are:
Ed Rusinek, Dr. James Young and Dr. Raymond Puffer



5 Original Bald Eagles Charter Members from Dundalk, MD
L to R : Chan King, Al Purcell, Ralph Ruud, Willie Miller and Julius Kany



L to R: Glenn Penner, Val Yarbrough and Pat Cunningham



Keynote Speaker, Don Martin from Sea Launch



Ed Rusinek, Michel Juif, Bill Axtell and Shirley Axtell



L. to R.: Florence Hoffman, John Hoffman, Walt Jones and Gloria Farquhar



L to R: Lee French, Larry L. Pearson and Richard Van Slyke



Ed & Mary Jane Caustin with Jeanne & Joyce Crockett



John Wiedenhoefer and Norm Morton



L. to R.: Sonnie Robertson, Lou Tiberio, Carl Elyash



L. to R.: Carolyn Rodgers, Beth Addington, Jo Ann Kock and Sondra Williams



Bob McDonald, Don Koons and Al Schoenheit



Cordell Bussel and Jacob Kingswwold



Standing: Earl Theaker
Sitting: Maxine Haun, Jean Theaker & Doria Elmlinger



Walt Jones &Moonyeen Fowler



Moonyeen & Ken Fowler



Bill Klem



Don Cruz, Dick Jacobson, Ed Kaston Bernie Besich, Leon McGinnis & Dick Weiss



Jim Ball, Walt Opheim, Chas Feltz & Barney Weltz

THE HUN ALSO RISES

By Dr. RAYMOND L. PUFFER, Historian
Air Force Flight Test Center

A long-established convention was broken on 25 May 1953 when the new YF-100 ***Super Sabre*** exceeded Mach 1 on its very first flight. North American Aviation's chief test pilot George "Wheaties" Welch performed the feat. During the course of a 57-minute test hop, Welch leveled out at 35,000 ft. tapped the afterburner, and soon passed Mach 1.1. Supersonic speeds were already fairly common in 1953, of course, but what made this achievement different ---aside from happening during a first flight---was that the F-100 was the world's first production fighter designed to exceed the speed of sound in level flight. That same afternoon, the new fighter performed another impressive accomplishment. Instead of being grounded for several days of post-flight inspection, Welch took the YF-100 aloft again for its second consecutive supersonic flight.

There was no doubt that the new F-100---the ***Hun*** as it came to be called---was a very hot airplane indeed. Designed while the Air Force's F-86 ***Sabres*** were battling higher-flying MiG-15's in the skies over Korea, the F-100 was intended to be a fast, hit-and-run day fighter---thin wings swept at *45* degrees; low drag fuselage and canopy; inboard ailerons; low-positioned, one piece horizontal stabilizer. A thin-lip oval engine air inlet fed air to a single large Pratt and Whitney YF-57-P-7 continuous flow axial gas turbine engine rated at 13,800 pounds of thrust. The term "air superiority" had just been coined, and that was certainly what the Air Force and North American Aviation, Inc. had in mind for their new fighter. Fast it definitely was.

Following its initial flight, the airplane was dived on separate flights to calibrated Mach numbers of 1.35 and 1.40. On 29 October 1953, Lt. Col. Frank K. "Pete" Everest took the YF-100 to a world speed record of 755.15 mph at the Salton Sea---the last time such a record was set at low altitude. If all of this seems somewhat sedate by today's standards, it must be remembered that it all happened a scant *six* years after Chuck Yeager became the first human to fly beyond supersonic speeds in the same skies over Edwards AFB.

But this is more than a story about another very hot airplane at the Flight Test Center. The ***Super Sabre's*** spectacular debut also suggested to many in the aerospace world that the state of the designers' art had become more advanced than it really was. It seemed that all they had to do was to fly their aircraft on paper and in wind tunnels in order to solve all of the problems of high-Mach flight.

But test pilots and engineers knew that the air, even more than the sea, can be terribly unforgiving of even the slightest mistake---that conditions exist which neither design studies nor wind tunnels can easily uncover. When the first F-l00As came off the production line, they looked somewhat different than the prototypes---the tall stabilizer tips had been cut down. Design studies had indicated that a shorter, thinner, broader-chord vertical tail could reduce drag while maintaining effective directional control.

But the Unexplored Regions can bite! The short-tailed F-l00As very soon began to show problems with stability and control. Then, on 12 October 1954, George Welch was checking out the problems when his ninth-production F-100A disintegrated in a dive over Rosamond Dry Lake. He had encountered a new phenomenon that was later called inertial roll coupling---yawing and laterals control tendencies that could throw a plane out of control and quickly overstress the airframe. Two other fatal accidents quickly followed.

An exhaustive evaluation program was undertaken that soon identified the culprit, and all F-l00As were subsequently reconfigured with larger area tails. The skill and professionalism of engineers and pilots gave the Air Force a versatile fighter that served the nation well for many years thereafter.



F-100 *Super Sabre*

THE VAKYRIE AIMS HIGH

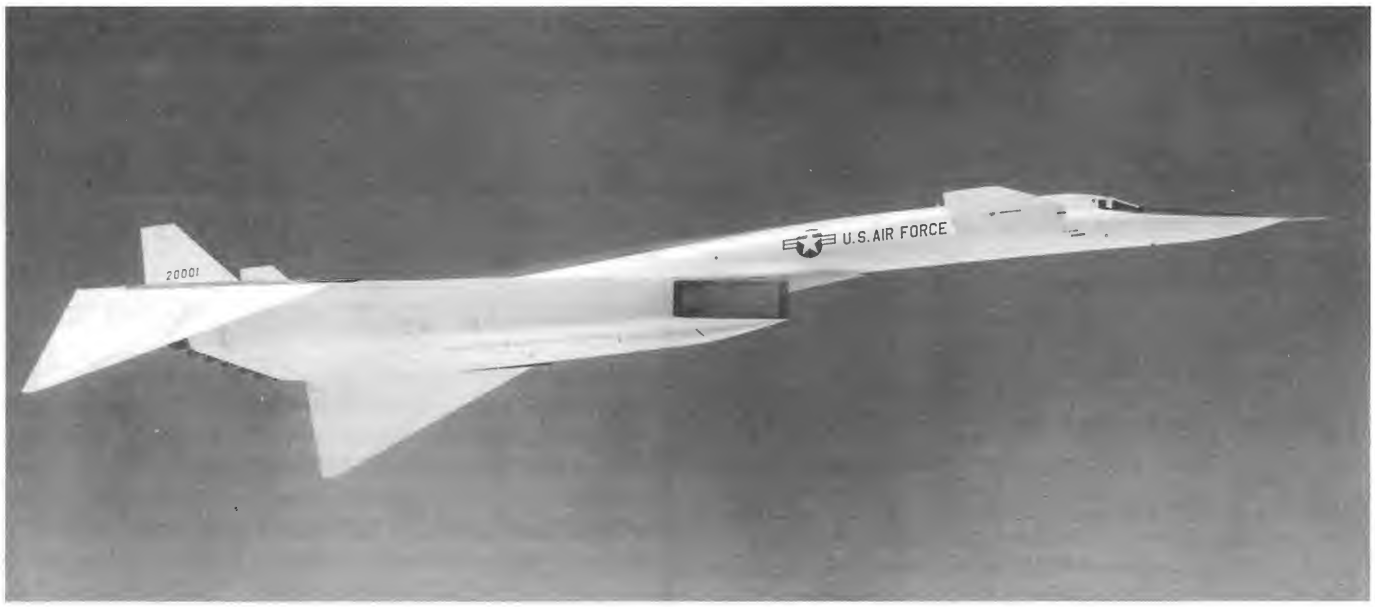
By DR. RAYMOND L. PUFFER, Historian

Air Force Flight Test Center

The fourth week in March seems to have a lot of significance for the XB-70 *Valkyrie,* the huge angular dart that seemed destined to become the world's first triple-sonic bomber. The concept of an attacker that could evade Soviet air defenses by flying far higher and faster than any interceptor then on the drawing boards was conceived in 1957. The AFFTC began preparing in 1962 for one of the most critical flight evaluation programs in its history. On 26 March of that year, AFFTC commander Maj. Gen. Irving L. Branch appointed Col. Guy M. Townsend as the XB-70 Test Director and assigned him a spot on his personal staff. However, even as the remarkable technological innovations for the ambitious project were rapidly coming together, the Soviet Union had already started a crash effort to build a fighter specifically to counter the new threat—the MiG 25. But even if the *Foxbat* with some 50,000 lbs. of thrust didn't pan out, parallel advances in missile development were making it unlikely that North American Aviation's giant airframe could ever outrun a missile attack. Consequently, by the time that Colonel Townsend assumed his post, the Air Force was radically changing its bomber doctrine: instead of high, fast, and bold, the next American bombers would slip into enemy territory following the nap of the earth. The XB-70 was scaled back from a bomber prototype to a Mach 3-research program. Only three experimental aircraft were ordered, and that was soon scaled back to two.

The Air Force still needed the advanced aerodynamic data that the new jets could provide, however, and only the AFFTC's expertise could certify them for the new research program. After the two gleaming whites *Valkyries* had arrived at Edwards, the mood on the Flight Test Center's ramp was brighter. North American's chief test pilot Al White and Col. Joseph F. Cotton brought the first XB-70 to Edwards from Plant 42 in Palmdale on 21 September 1964. On 17 July 1965, they ferried in ship number two. Once past the usual teething troubles, it was obvious that their performance was indeed extraordinary. Sustained flight at high supersonic speeds was the goal, and this the Valkyries began to do on a routine basis. One important milestone was reached on 24 March 1965, when Al White and North American pilot Van Shepard took the XB-70 on its first double-sonic flight. They went to 56,000 ft on that sortie, quickly reached Mach 2.14 (1365 mph), and flew beyond Mach 1.0 for 74 minutes—40 minutes of which were in excess of Mach 2.0. That was the day that Las Vegas, Nevada learned about the project. The supersonic bomber and its B-58 chase plane passed twice over the city, once at Mach 1.9 and again at Mach 2.1, slamming down a series of heavy sonic booms which flooded telephone switchboards and set off a memorable civic uproar.

In an era when most supersonic aircraft could exceed the speed of sound for only brief periods, the world suddenly had to come to grips with the prospect of very large aircraft making prolonged supersonic flights over their heads on a regular basis. Exactly one year later, on 24 March 1966, Lt. Col. Fitzhugh "Fitz" Fulton and Al White reinforced the issue. On that date, they took ship number two on its first long cross-country flight, from Edwards to Carswell AFB, Texas. The XB-70 research program was well on the way to its goal of sustained flight at Mach 3.0.



The XB-70A *Valkyrie*

CONTRAILS FROM THE PAST

by ED RUSINEK

Dear Ed,

The article about the Navaho project in the Spring 2001 issue of the retirees Bulletin brought back memories about the first use of titanium on that vehicle and the problems we encountered. As a Manufacturing Research Engineer, an engineer from Advanced Design introduced me to titanium. He showed me a 2" square of the metal and told me this would be a whole new era in airplane construction

The first parts made, using titanium, were heat formed into shape and appeared perfect. Two days later they developed horrendous cracks, which totally ruined the parts. A metallurgist suggested out gassing the titanium in a Space Division high temperature autoclave

This allowed us to form parts without cracks, however, drilling titanium was another major issue. The only practical way was to use cobalt drills and lots of coolant at the time; at the time Russia controlled all the cobalt so we had to buy the drills from their Soviet Satellite partners.

During a metal display at the Biltmore Hotel in downtown Los Angeles, I met George Shriver, the owner of "Molectrics" in Inglewood; he was demonstrating a new cleaning process with electrical controls. He didn't have any titanium so I provided him with a sample. He cleaned the metal and bent it to 90°, he subsequently placed the piece in a vise and completed the bend without any cracks.

The Summa process, as he called it, solved the cracks problem in titanium and this metal became, from then on, a major factor in aircraft design. Later, the Summa process was used to clean all the tubing and metal for the Apollo-Saturn program.

Finally, the German V-2 Rocket engines used diffusion bonding of steel to join metal sections together. They applied heat and a protective gas to cause the molecules to transfer and unite together to form a complete joint. Trying this process on titanium, we found that we could heat the stainless steel retort with encased titanium in an argon atmosphere to 1750° and bond the titanium pieces together.

Cordially, Lou Frost Laguna Hills, CA

Dear Ed,

I was pleased to see the centerfold photo of NAA's 1938 Engineering Department in the Spring 2001 issue. After Lee Atwood's passing, his personal contributions not given to the Smithsonian, were donated to the Santa Maria Museum of Flight. I identify and catalog all items associated with North American Aviation at the Museum.

Among the items received was a framed copy, with names on the back, of this same photo. It is the intent of the Museum Board to have a North American Aviation section in the new hangar and I hope to hang a series of photos of outstanding NAA individuals when the day comes ....

One learns many fascinating things from these old historical files. There is the story of Robert C. Chilton — "Mr. P-51". After completing his pilot training at Mines Field, he became a civilian flight instructor at Santa Maria for Army cadets and officers in training in October 1939. From January 1941 until March 1941 he ferried RAF Harvard trainers for NAA to Canada. After a check ride with Tex Wild, he joined NAA Flight Test as a company pilot.

Respectfully, John Henderson, Ventura, CA



Ed wouldn't have been standing under there if bombs were suspended above his head!

At the yearly Air Show held at Pt. Mugu NAS on April 1, 2001, staffer Ed Rusinek got a rare opportunity to examine the open Bomb Bay of the North American Rockwell B-1B "*Lancer*" bomber.

The plane and crew were from the Cheyenne Air National Guard. Because of fog and very low clouds, the flight portion of the Air Show was restricted to a few passes by aerobatic sport aircraft and a pair of bright Red Smirnoff Vodka MiG-17s.

SANTA MARIA MUSEUM NEEDS HELP!

The Santa Maria Museum of Flight recently rescued an F-86F Sabre from China Lake Naval Air Station. The aircraft arrived in pieces and will be a major effort to restore it for display in the museum. Thousands of dollars will be required to accomplish this task. Since everything in the museum is done by donation of time, talent and **Treasure,** can you help? Please send your tax deductible donations to:

K. R. (Dick) Weber
Santa Maria Museum of Flight
3015 Airpark Drive.
Santa Maria, CA 93455-1821.

EDWARDS AFB OPEN HOUSE IN OCTOBER

The open house at Edwards Air Force Base this year will be held on October 20-21, 2001. The theme of the event will be the celebration of the Fiftieth Anniversary of the Air Force Flight Test Center. Although the program is still being organized, it is anticipated that General "Chuck" Yeager will be present to reenact his breaking of the sound barrier.

In reviewing all of the scientific and engineering feats that were accomplished at EAFB during these past 50 years, it is hard to imagine that ancient man once traversed this inhospitable site.

Archeological findings indicate that Native Americans inhabited the area on a seasonal basis as early as 20,000 years ago. The region was explored by the Spaniards in the 18th Century, and by Americans, namely John C. Fremont, in the early 19th Century. The first permanent settlements, however, came about with the expansion of railroads into the western Mojave during the 1870's.

The Southern Pacific Railroad was first in the region in 1876, when it extended a line from the San Joaquin Valley, over the Tehachapi Mountains, and through the Antelope Valley toward Los Angeles. In 1882, additional tracks, which would become a part of the Atchison, Topeka and Santa Fe network, were extended westward out of Barstow toward Mojave and crossed what is now Rogers Dry Lake on Edwards AFB.

In 1910, Clifford Corum established a homestead near the immense dry lake. To attract others, he built a combination general store and post office. His request to have the post office named "Corum" was disallowed by postal officials because a similar name was already in use elsewhere in California. So, he simply reversed the spelling of his name to "Muroc". It was a name that would become associated with flying and flight-testing for nearly 40 years.

The location was first used by the military in 1933 when a small detachment from March Field laid out some temporary bombing and gunnery ranges. By 1937, the entire Army Air Corps was conducting maneuvers there and a semi-permanent tent camp was established along the eastern shoreline of the lakebed.

Designated originally as the Muroc Bombing and Gunnery Range and later as the Muroc Army Airfield, the base played an important role in the training of fighter and bombing crews throughout WW II.

In 1942, a team from the Material Center at Wright Field in Dayton, Ohio came to Muroc to evaluate it as a potential site for a test program rivaling the Manhattan Project in secrecy! The suitability of the location was evident and the test program for the Bell XP-59A "Airacomet" was moved to a hastily constructed area at the north end of Muroc Dry Lake. On October 1, 1942, Bell test pilot Bob Stanley took the first jet aircraft up for its maiden flight and America's jet age began.

In the post-war years, the operations at both North and South bases were combined and the installations became a full-time flight test facility where aviation records became almost common place. The attempt to exceed the fabled "speed of sound" was accomplished on October 14, 1947 when Capt. Charles E. Yeager piloted the Bell X-1 to a speed of Mach 1.06.

The first stages to develop a rocket engine test site along Leuhman Ridge, above the shore east of Muroc Dry Lake, were begun. This site has since been transformed into Phillips Laboratory, where the technology for ballistic missiles and space motors is being developed.



Ceremonies were conducted on January 27, 1950 renaming the base in honor of Capt. Glen W. Edwards (above), an accomplished test pilot killed in the crash on June 5, 1948 of an experimental Northrop YB-49 "Flying Wing" bomber

The Air Force Flight Test Center was officially activated at Edwards AFB on June *25,* 1951; just four months after the Test Pilot School had been transferred to the base from Wright-Patterson AFB, Ohio. On January 1, 1979, the Hill and Wendover Ranges and part of the Dugway Proving Grounds in Utah were consolidated into the Utah Test and Training Range and placed under the management of the ALFFTC.

Over the years, Edwards has become synonymous with aeronautical achievement and famous as the site of many "firsts". It is where the nation's first jet- and rocket-powered flights took place. It is where men and machines first exceeded Mach 1, 2, 3, 4, 5 and 6, and where they first flew above 100,000, 200,000 and 300,000 feet. The famed North American Aviation X-1 5 rocket aircraft set altitude and speed marks of 354,200 feet and 4,520 mph that still stand for winged aircraft.

Silent Majority (continued from page 15)

WOO, KLIRY -- passed away the week of June 19, 2000. He worked in Autonetics Flight Control.
ZAIS, GUSTAVE "GUS", 78 -- of Springfield, OR passed away at home on March 13, 2001, of an aortic aneurysm. Gus worked for 37 years at North American/Rockwell in management at several divisions. His daughter, Susan LeRoy, notified us.

SILENT MAJORITY INFORMATION

When reporting an obit for the Silent Majority, please include the person's age and the date of his passing away. You may also include the cause of death, his position and his last place of work at NAA/Rockwell, if these facts are known.
Thank you



IN MEMORIAM

WALKER, DAVID M., 56 — A Former NASA and Captain USN, Ret., died on April 23, 2001 at the M. D. Anderson Cancer Center in Houston, TX. A graduate of the U.S. Naval Academy, he completed flight training and was designated a naval aviator. After duties aboard the carriers USS Enterprise and USS America he took further training to become a test pilot. He logged more than 7500 hours flying time and was selected by NASA in 1978 to become an astronaut. A veteran of four space flights David logged over 724 hours in space. He was the pilot aboard STS-51-A on DISCOVERY and mission commander for STS-30 on ATLANTIS, STS-53 on DISCOVERY and STS-69 on ENDEAVOR. He is best remembered for his many visits to Downey and other NAA/Rockwell facilities to present the highly prized Astronaut "SNOOPY" Awards to outstanding employees.

ALLEN, MAX, 87 -- passed away in Carlsbad, CA on April 7, 2001, after cancer surgery. Max started as an engineer in the Wing Group at LAD and later in Palmdale. His good friend, Gus Ruppert, notified us.
ANDREW, LOWELL VICTOR, 78 -- of Fullerton passed away April 21, 2001 of cancer. He worked as an aerospace engineer. Information from letter and obituary notice sent by William T. Schleich.
AUSTIN, VINCENT J. -- Torrance, CA, died April 5, 2001. He was a retired flight systems engineer for Rockwell. Information read in an obituary of the Daily Breeze.
BANGERT, EVELYN -- passed away the last week of May 2001. She was a North American/Rockwell retiree. Information received from Andy Tindley of Torrance, CA.
BELL, GEORGE, 69 -- of Buena Park, CA, died March 31, 2001, of cancer. He was a retired engineer for Rockwell International. Information obtained from an obituary in a local paper.
BERGDAHL, DAVID -- passed away June 20, 2000 after a history of heart problems. He was a propulsion and Fluid System expert on NAVAHO, X-15, Paraglider, Saturn and several limited access programs. He retired in 1989 after a 34-year career. A good friend, Merle Johnson, notified us.
BLANCHARD, LARRY, 80 -- of Calimesa, CA died May 1, 2001, of complications of bypass surgery. He was in Quality Control management at NAR. Information from an obituary sent in by Ken Fowler.
BOWER, JOHN L, SR., 86 — passed away May 20, 2001, in Santa Monica, CA, He worked at NAA from 1950 through 1958 in the development of numerical controls machining. Information obtained from an obituary in a local newspaper.
BRENT, FORREST -- of Manhattan Beach, CA, passed away December 26, 1999, after two years of Alzheimer's Disease. He retired in 1984, from Autonetics, after 38 years. His wife notified us.
BRODERICK, RAY - passed away August 4,2000. Notified by e-mail by Jim Sexton.
CARPER, GRACE L --Retiree News returned, marked "deceased"..
CRASSE, DANIEL EDMOND, 77 -- of Anaheim, CA, passed away March 27, 2001, due to congestive heart failure. He was an electrician for Rockwell International. Information obtained from an obituary in a local paper.
CHRISTIANSEN, MILT "CHRIS" -- passed away May 26, 2001. His wife, Jean, notified us.
CLARK, LARRY DEAN, 64 -- of Westminster, CA, a manager for Boeing Aircraft, died April 16, 2001, of cancer. Information obtained from an obituary in a local newspaper.
CLOTWORTHY, PHYLLIS COLLINS -- died at home on May 10, 2001, after a long battle with lung cancer. She was the wife of Lee Clotworthy. Information obtained from an obituary in a local newspaper sent in by Al Kustra.
CONSTANTINEAU, ALBERT ROBERT, 84 — of Hemet, CA, passed away May 17, 2001. He was an inspector for North American Aviation in El Segundo for 20 years. Information from an article in the Riverside Press- Enterprise sent to us by E. G. Logelin, Hemet, CA, Gene Somers, Idyllwild, CA and R F. Williams.
CROSS, LEONARD 5., 85 -- passed away March 13, 1999, from a cerebral hemorrhage. He started at NAA in 1947 and was in management in Purchase Labor. His wife, Evelyne, notified us.
DROBKA, ROBERT GUY — passed away March 29, 2001. He retired in 1990 after 37 years of service with Rockwell International at Los Angeles and Canoga Park. Information obtained from the Daily Breeze.
DUNBAR, KATHLEEN — wife of James Dunbar, passed away May 27, 2000, after several years of battling Alzheimer's disease. Jim Dunbar worked in the Engineering specifications group and retired in 1984.
ESSINGTON, LARRY D., 66 — died from a heart attack in Downey, CA on April 26, 2001. He was a material-scheduling manager when he retired in 1996, after 34 years of service on many projects, including Apollo, B-1, and Space Shuttle. A good friend, Ken Gallagher, notified us.
FREDENALL, VIOLA, 87 — passed away February 7, 2001. She worked in the Planning Department of North American Rockwell for over 10 years. Information obtained from an obituary notice in the Hemet News, sent to us by Robert F. Williams.
GAONA, ROBERT J., 70 - died May 23, 2001, at Duke University Hospital in Durham, NC. He retired in 1988 from Rocketdyne as a contract pricer after a 30-year career. He and his wife, Dorothy, moved to Raleigh, NC in 1995. Information obtained from an obituary notice in the newspaper.
GATES, CHARLIE, 87 -- died at his home in Tuttleton area in Sonora, CA. He was active in the California Sports Car Club and won six West Coast titles and one national title during his time racing. Charlie was a Field Service representative for NAA during WWII and the Korean War. Information from the Sonora, CA Newspaper sent in by Bernard (Bob) Barnes, NAA Field Service Publications.
GAZELLE, PATRICIA OLSON, 77 -- of Anaheim, CA, a retired planning clerk, passed away April 18, 2001, of a heart attack. Information obtained from an obituary in a local newspaper.
HALL, LYTLE L, 83 -- died March 3, 2001, from complications of angina. He retired in 1988, from Tool Design at LAD.
HARBERT, DONALD B., 85 --passed away May 29, 2001. He was aerospace engineer with North American Rockwell for 30 years. Information obtained from an obituary in a local paper.
HART, WILLIAM H. "BILL", 77 -- of Las Vegas, formerly of Yorba Linda, CA, a retired systems analyst for Rockwell International, died April 13, 2001, of Alzheimer's Disease. Information obtained from a local paper.
HAVER, CHARLES HENRY III, 69 -- of Fullerton, CA passed away July 18, 2000, of heart disease. He worked at Autonetics for many years in

Human Resources. Obituary submitted by Maxine Haun.
HUNSICKER, RUSSELL LOREN, 78 -- passed away at his home in Manhattan Beach, CA, on April 2,2001. He was employed with North American Aviation from 1952 to 1982, when he retired from the company. Information obtained from local newspaper.
HOUSTON, ELSIE JEAN, 79 -- of Seal Beach, CA, passed away June 5, 2001, of heart disease. She worked as a typist for Rockwell International. Information from Ed Rusinek, and an obituary sent by Maxine Haun.
KAMMEYER, HERBERT B., 73 -- of Fullerton, CA, a chemist for Rockwell International, died April 26, 2001, of heart disease. Information obtained from a local paper.
KRELL, HAROLD, 76 — passed away December 27, 2000, at a convalescent hospital in Hemet, CA. He worked as a technician for 33 years at Rockwell International in Anaheim. From an obituary notice in the Hemet News sent by Robert F. Williams.
LAFAYETTE, ROBERT M., 77 — died on April 11, 2001, in Hawthorne, CA. He retired as a planner in 1987. A good friend, Loren Johnson, notified us.
LEVINE, DON L — passed away January 20, 2001 of pancreatic cancer. Don was an engineer in the ECS group at Space Division for about 30 years, retiring in 1989. We were notified by his wife, Beverly (Sue), Cypress. CA.
LOMBABDI, FRED — passed away June 12, 2000. He worked in Warehousing at LAD for many years. Glenda Kelly and Rhoda Bosdet notified us.
LONG, RICHARD, 64 — of Hemet, CA, passed away at home of a heart attack February 3, 2001. He worked as a Purchasing Agent for Rockwell International for 29 years. Information obtained from an obituary notice in the Hemet News sent by Robert F. Williams.
LUNDE, RUDOLPH NORDLAND "RUDY", 83 — passed away April 4, 2001. He worked for Rockwell for 35 years as a tool and die maker. Information obtained from a local newspaper.
LUNDKVIST, BECKY-- passed away October 2000. Becky worked in Surplus Property at LAD. Glenda Kelly, who was informed by Becky's husband, Bennet, notified us.
LYNN, GEORGE WASHINGTON, 77 -- passed away April 7, 2001, at his home in Hemet, CA. He was a technician for 13 years at Rockwell International in Anaheim. Information from an article sent in by Gene Sommers.
MILLER, ROBERT AUGUST, 78 -- passed away peacefully on May 21, 2001, in his home in Vista, CA. He joined NAA as an engineer in 1950 and lived in the South Bay area until his retirement in 1986. Obtained from an obituary notice in a local newspaper.
MOORE, MILDRED V., 78 -- of DeSoto, Mo., formerly of Anaheim, CA, an accountant for Rockwell International and Hughes Aircraft, died June 4, 2001, of cancer. Information from an obituary sent in by Maxine Haun.
MOTLEY, DAVID, 71 -- Santa Ana, CA, was killed April 28,2001, piloting an experimental plane in the Mojave Desert. Information from an obituary in the Orange County Register sent in by Maxine Haun.
PELLAND, PHIL, 84 -- of Redondo Beach, passed away on April 6, 2001, due to heart failure. Phil was a design engineer and worked on the B-70, B-1 and the Space Shuttle at El Segundo and Downey. His good friend, Dan Shaefer, notified us.
REGAN, THOMAS L, 88 -- passed away May 10, 2001 at McAlester Regional Health Center, Oklahoma. Tom worked in various management positions for nearly 40 years at LAD, Fresno and Space Division and left to be Plant Manager at the McAlester Plant in 1963 until retirement in 1975. Gene sent in information and Ruby Hales, of Stuart, Oklahoma, who also sent us the obituary.
RONNINGEN, JOHN O. --passed away April 18, 2001. John was in management in Quality Control. He hired in at LAD in 1941, and retired from Space Division in 1979. Ron Bishop, Fountain Valley, CA, notified us.
ROSS, DONALD, 76 -- died of a heart attack on March 13, 2001, at Inland Valley Regional Medical Center in Wildomar, CA. He served in the US Army from 1943 until 1945 and received the Purple Heart. He retired from Rocketdyne after 31 years as an engineer. His friend, Bill Hurd, notified us.
SCHRIVER, JOHN R, 70 --passed away after a long bout with cancer on March 27, 2001 in Fullerton, CA. John started as an electronics engineer at Autonetics in Anaheim in October 1959 and retired in August 1992. His wife, Lois, informed us.
SCOTT, NEAL — of Aloha, OR, passed away April 3, 2001. He had suffered a massive stroke in February and was hospitalized until his death. He worked as an aeronautical engineer in Engineering Flight Test at LAD, and also spent time at Edwards Air Force Base and China Lake. Information sent to us by Jean E. Ronif, Engineering Flight Test at LAD.
SHERMAN, LYLE, 86 -- long-time resident of Fallbrook, CA, died in Spring Valley, CA, April 9, 2001. Lyle was an aeronautical engineer for 33 years, working on such projects as Apollo, Saturn and B-l Bomber. Howie Burhop, Fallbrook, CA, notified us.
SHORT, RAY, 85 --passed away March 27, 2001, of a heart attack. He worked as a dispatcher at Rockwell International in El Segundo for 30 years and retired in 1977, then moved to Hemet, CA. Information in an obituary notice in the Hemet News sent in by Robert F. Williams.
SHULER, THOMAS K "TK", 76 --passed away on April 9, 2001, in Moraga, CA. He was a Silver Eagle contributor to the Retirees Bulletin. TK started at NAA in 1951 as an engineer in the Flight Control Section of the Aerophysics Lab. He transferred to Autonetics where he held several management positions including VP and General Manager of the Minuteman Division. He retired in 1986 and had been in poor health for the last two years. Maxine Haun, and a good friend, Bob Nease, notified us.
SIEGEL, SIDNEY, 89 --died March 16, 2001, of cancer, at his home in Pacific Palisades. He was a charter member and former president of the American Nuclear Society and from 1950 to 1972 he was vice-president and national director to Los Angeles based Atomics International. Information from an obituary sent in by George Wiley, Manhattan Beach, CA.
SMITH, JAMES PAUL--passed away in May, 2001. He was a Systems Engineer for Rockwell International Engineering in Anaheim, CA for 20 years. Information sent by Sonnie Robertson and Maxine Preston obtained from an obituary in the Riverside Press Enterprise.
STANLEY, JOEL G., 80 -- passed away April 16,2001, in Lavaca, AK. He retired from North American Rockwell in 1983. Information obtained from an obituary in a local newspaper.
STANTON, CURTIS, 86 -- of Garden Grove, CA, passed away on April 3, 2001, from the complications of a series of strokes in the last three years. Curtis hired in at LAD in 1947 and transferred to the Space Division in Downey. He also worked at the plant in Kansas City. He retired from Seal Beach in 1980. Danny Lopez notified us.
STEVENS, CLAYTON L, 80 -- of Brea, CA, died on April 17, 2001. He retired as an engineer from Space Division after more than 23 years on the Apollo and Space Shuffle programs. From an obituary and letter provided by William T. Schleich from Fullerton, and Maxine Haun.
STUART, JAMES C., 80 -- of Laguna Woods, CA, passed away April 24, 2001, of lung cancer. Obtained from an obituary in a local paper.
UNDERHILL, FRED, 79 -- passed away July 13, 2000, of pulmonary problems. He worked from 1939 to 1980 on engineering flight test projects both at Los Angeles and Palmdale, and retired from Space Division, Downey, on the Shuttle Program. His wife, Barbara, notified us.
WILLIS, WILLIAM E., 80 -- of Atascadero, CA, passed away on May 8, 2001. He retired from Rockwell International after 28 years and then spent 20 years as a gunsmith. Information from a San Luis Obispo County Gazette obituary sent in by Arnold E. Hermansen, Atascadero.
WILSON, MEL --passed away on March 3, 2001, from cancer after extensive radiation and chemotherapy treatment. His good friend, Don Wegner, notified us.
WINSLOW, DORIS M., 95 -- died quietly in her sleep in Orange, CA. Doris worked in Blueprints Control. Information obtained from an obituary in the Irvine World News.
WITTER, DON - passed away February 10, 2000. He worked as a field service instructor in various locations on aircraft being built by NAA, including the B-70, as well as missile programs (Saturn & Apollo) We were notified by Leon McGinnis.

Silent Majority Continued on page 13

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Bob Crockett attended the Rally of the Warbirds at Bishop and provided the photos seen here. He noted that the trainer above is a T-28B built in Downey in 1953/54, the other 14 on the right are T-28C built for the Navy.
Our sincere thanks to Bob Crockett

T-28 "WARBIRDS" FLEW INTO BISHOP

On Friday, May 18, 15 NAA T-28 trainers and other vintage aircraft flew into the Bishop Airport in California. After visiting with the public, a special dinner was prepared by the Bishop Airport Café. The pilots spent the night there and departed for Nevada the following day

Other photos in this issue are courtesy of the AFFTC History Section